THE HEATING AND VENTILATING MAGAZINE

Vol. XII. No. 7
$1.00 a year. 10 cents a copy

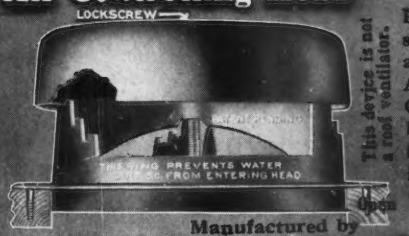
NEW YORK, JULY, 1915.

Publication Office:
1123 Broadway, New York

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 12 E. 42ND ST. 188-200 FRANKLIN ST. BOSTON.

THE "GLOBE" VENTILATOR
COPPER AND GALVANIZED IRON
SIMPLE, SYMMETRICAL, STORM PROOF, SUCCESSFUL
Model and Blue Print on Application
GLOBE VENTILATOR CO., TROY, N. Y.

Knowles Mushroom Diffuser and Air Controlling Head (Improved Notch Style) ADJUSTABLE



This device is not a roof ventilator.

Placed under seats in all auditoriums. A perfect Air Controlling Head and Diffuser, assuring *uniform distribution*.

Manufactured by
Knowles Mushroom Ventilator Co.
Successor to Geo. E. Knowles
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AIR DUCT TEMPERATURES
Should be continuously recorded by means of
TRADE MARK
BRISTOL'S
REG. U.S. PAT. OFFICE.
Recording Thermometers

Temperature record should also be secured with these automatic recorders in rooms heated, and the chart records compared each day to guide operation of heating and ventilating systems.
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FEED-WATER FILTERS
Will Keep Oil Out of Your Boiler
Regulating Valves for Water, Steam, Air
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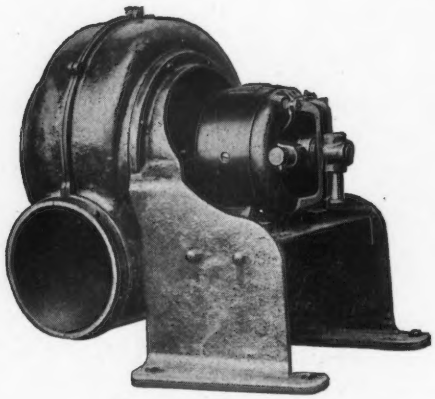
Westinghouse-Ventura Fan



Westinghouse-Sirocco Blower

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Solve Ventilation Problems

Westinghouse-Ventura Fans, for supplying large volumes of air with unobstructed flow.

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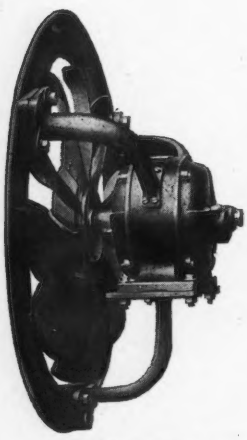
These two types enable you to provide adequate ventilation under all conditions. Their use insures satisfied clients because they are—



Side View of Fan
Note compact horizontal dimension

Easily installed.
Compact in dimensions.
Quiet and clean in operation.
Very economical in the use of current.
Attractive in appearance.
Operated from light circuit.
Require practically no attention.

For ratings, dimensions, capacities and prices send for complete information.

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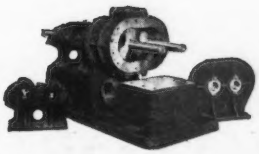

CONNERSVILLE VALVELESS ROTARY VACUUM HEATING PUMPS are used on the return line vacuum heating system, acting as boiler feeder and vacuum producer so that their use greatly simplifies the system.

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There are six large, ring-oiling, Babbitt lined bearings, all supported on one-piece bedplate. Gears are enclosed in an oil-tight housing apart from Pump case.

They are in use in high grade buildings in all parts of U. S. and Canada.

THE CONNERSVILLE VICTOR POSITIVE PRESSURE BLOWER OR EXHAUSTER has been used for vacuum cleaning since the inception of this method of cleaning.

Remarkably simple, only two moving elements, no internal contact or wear, no oil or dope used inside the Blower case.

Ring-oiling, renewable, phosphor bronze bearings, gears contained in a separate housing, the only attention required is the changing of oil in the bearing reservoirs and gear housing at monthly intervals.

Used by a majority of the best-known manufacturers of vacuum cleaning apparatus.

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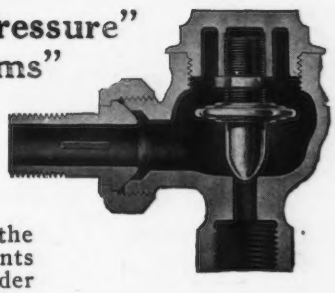
114 Liberty Street

MARSH REFLUX JUNIOR
THERMOSTATIC TRAPS

For Radiators and Coils of "Low Pressure" "Vapor" and "Vacuum Heating Systems"

Freely Discharges Air and Water WITHOUT LOSS OF STEAM



THE Marsh REFLUX Return Line Trap is for use on the return end of radiators of low pressure, vapor and vacuum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve, in order that it may accomplish what is desired of it, namely, **to free the radiator of air and water without the loss of steam** and to do so **noiselessly.**

The Marsh Reflux Junior Thermostatic Trap is recommended for small radiators and coils. This Trap for the small and the Original Reflux for the large units will make an ideal job.

Especially adaptable for two pipe gravity work and vapor systems.

May be furnished either concealed adjustment (as illustrated) or with outside adjustment. **Write for literature fully describing this trap**

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Established 1865

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Manufacturers of Gauges for all Pressures and Purposes. Automatic Air Valves and Steam Specialties.

ILG

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ARE PREFERRED BY THE

MOST DISCRIMINATING USERS

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Fisk Rubber Company	use 25
Sulzberger & Sons (Packers)	use 25
National Lamp Company	use 25
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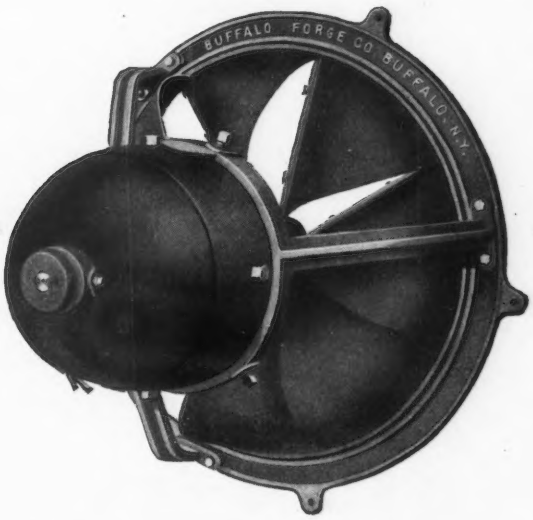

Experiments again prove Buffalo Leadership

And now it is Disk Fans. Up to the present time—Disk Fans—have been a neglected branch of Fan Engineering.

That desire to "keep ahead" by the Engineering Staff of the Buffalo Forge Co. has resulted in a new

BUFFALO CURVED BLADE PROPELLER WHEEL FAN

Very thorough experimental work, for the past six months, has given us new data over a wide range of conditions, that show a margin of efficiency for **Buffalo Fans** over all others of the same type.

Write for Bulletin 182E-36.

BUFFALO FORGE COMPANY

Buffalo, N. Y.

Manufacturers of Air Washers, Spray Nozzles, Heating, Ventilating and Drying Apparatus.

Canadian Blower & Forge Co., Ltd., Berlin, Ont.

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STEAM HEAT IS NOT GOOD

unless it is properly distributed and an excess in any one place is most unpleasant. To secure correct and equable adjustment all over the system.

LAVIGNE PACKLESS QUICK-OPENING STEAM RADIATOR VALVES

should be used.

They positively will not leak air, water, or steam.
They completely open or completely close with but ⅞ turn of the handle.
They are made in six sizes, in every style of handle.

Leading jobbers everywhere carry them

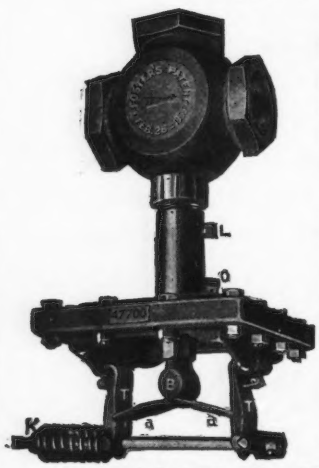
LAVIGNE MANUFACTURING CO. Detroit, Mich., U. S. A.

For Safety, Sureness of Operation and Durability

FOSTER PRESSURE REGULATORS

FOR STEAM HEATING SERVICE

(Classes "Q" and "Q H")



lead the way. Designed especially for steam heating, and suitable for vacuum systems, for delivery pressure of from 1 to 15 lbs.

We make several types of pressure regulators—those shown in the illustrations here were designed particularly for steam heating service, and they are very sensitive, reliable, high grade in every particular and superior to other makes in construction and workmanship. There are no weights or close fitting pistons, and are easily adjusted to the desired pressure between 1 and 15 lbs. Made in sizes ¾ inch to 2 inches inclusive, composition body. Larger sizes are fitted with composition renewable seats.

Class "Q" Class "QH"

FOSTER ENGINEERING CO., Newark, N. J.

CHICAGO, ILL., 180 North Dearborn Street **PHILADELPHIA, PA., 601 Harrison Building**
PITTSBURGH, PA., 518 Park Building **BOSTON, MASS., 161 Summer Street**

These Valves are fully explained on Pages 29 to 33 of our 1913 Catalogue, No. 20. Please mail copy of Catalogue to

Name *Address*

POSITIVE REDUCTION
AND
CLOSE REGULATION

Two essentials amply fulfilled by Mueller 13160 Reducing and Regulating Valve—the best all around valve on the market

13160

In any case where considerable reduction and close regulation are desired don't fail to install the

MUELLER 13160

The Mueller line of valves is most complete, covering every phase of pressure reduction and regulation.

Write for No. 5 Catalogue.

H. Mueller Mfg. Co.
Decatur, Ill.

New York
145 W. 30th St.

San Francisco
589 Mission St.

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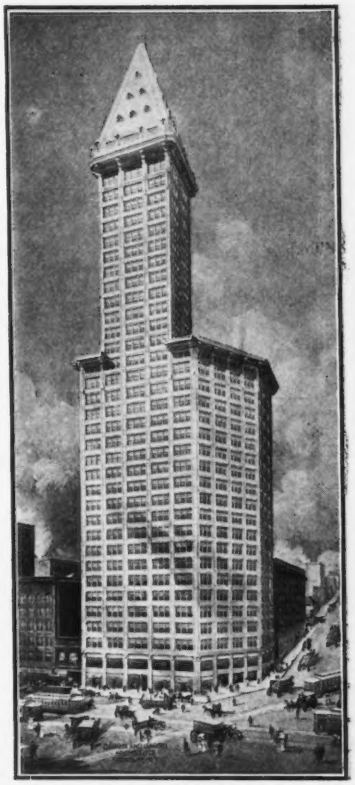

42-Story L. C. Smith Building, Seattle, Wash.

We feel real good in showing the illustration of this building in which over 900

SYRACUSE Packless Valves

were used on the Vacuum Heating System, particularly as it is the highest office building outside New York City.

Send for new catalogue.

Syracuse Faucet and Valve Co

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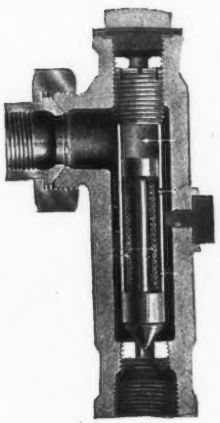
Two Pipe Low Pressure—Vapor—Vacuum Heating Systems

Principle—Thermostatic
Motive Power—Liquid Expansion and Contraction

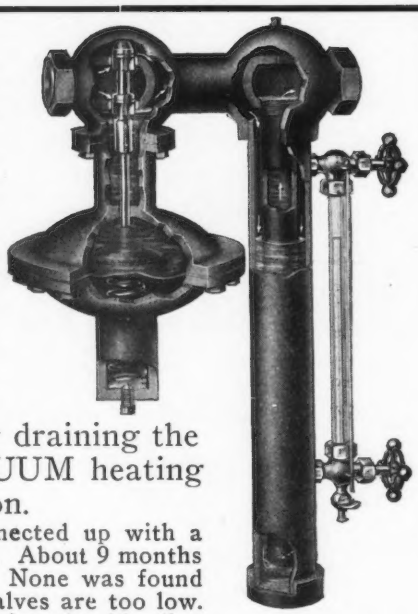
Positively noiseless in operation. No place for scale and dirt to lodge. Contact between head of valve and seat a line instead of surface. Distance inlet to outlet 3″ or 1¾″ and can be installed at any angle. Guaranteed not to stick or air bind. You cannot buy a more accurate Radiator Trap no matter how much more you pay for it.



Send today for list and trial offer

SARCO ENGINEERING COMPANY
Old Colony Bldg., Chicago **South Ferry Bldg., New York**

A Steady Stream



TWO years ago, while working on some tests on diaphragm valves for extremely low pressures, such as are required for VAPOR or VACUUM heating, it seemed that a reducing valve that would maintain a constant pressure, expressed in ounces, above or below atmosphere, would, in combination with a water seal, make a pretty good trap for draining the condensation from a VAPOR or VACUUM heating equipment served from a Central Station.

Our special low pressure reducing valve was connected up with a 3-ft water seal and hitched to a 90-lb. steam header. About 9 months later the valves were examined for wire drawing. None was found and none was expected as the velocities through valves are too low. That was the last time the trap was examined and it is today bleeding the condensation from the same old header at the same old STEADY STREAM—about the size of a match.

This "STEADY STREAM" ought to appeal to the man who is trying to measure the condensation from heating equipments under pressure.

CORRECT METERING demands a STEADY STREAM

J. C. HORNUNG, Engineer, 111 West Monroe St., Chicago

Presto

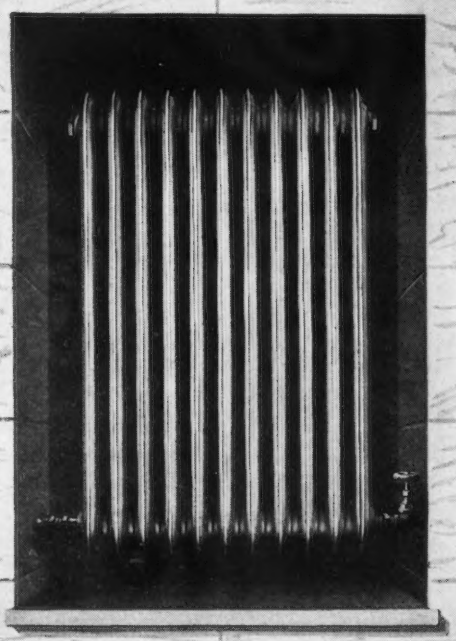
Requires No Grille Work

It meets the eye with a pleasing, simple dignity of design and finish that fits unobtrusively in the refined home interior or the marble-walled public building.

The scientific construction supplies quick, well-distributed heat, permits easy access to every part for hand-cleaning, saves one-fourth less space and one-third the weight of other types of equal heating capacity.

Grille work gathers dirt and dust, retards circulation and heating efficiency. Eliminate all of this and insure absolute sanitation and greater heating value by using Presto Sanitary Radiators. Complete information and data upon request.

PRESSED METAL
RADIATOR CO.
PITTSBURGH, PA.



"The Connersville System" Vacuum Cleaner

Bungalow Type

No Matter How Large We Make It

A few reasons WHY you should buy "The Connersville."

BECAUSE
It is a CLEANER that CLEANS.

BECAUSE
It renovates everything in the building from cellar to garret.

BECAUSE
It is Sanitary, no dirt or dust is blown into the open air to jeopardize the health of your neighbors.

BECAUSE
It is the simplest, most durable and economical.

BUNGALOW—TYPE. Price complete $150.00 F. O. B. FACTORY.

UNITED VACUUM APPLIANCE COMPANY, Connersville, Indiana

"IT PULLS"

"IT PULLS"

The Kernchen Siphonage Ventilator PULLS.

Show us ONE instance where the Kernchen Siphonage Ventilator has been torn down and replaced by any other kind.

Other ventilators are being rapidly torn down and replaced by the Kernchen Siphonage, for

"IT PULLS"

Send for illustrated booklet containing copies of unbiased OFFICIAL TESTS conducted by leading reputable Institutes of Technology and SIGNED by their Professors. Our engineers are at your service gratis.

Beware of Imitations and SIMILARITY OF NAMES. Avoid Litigation and Law Suit, as Infringers will be prosecuted. Send for our "Protect Yourself" Warning Circular.

Kernchen Company, Ventilating Engineers

GENERAL OFFICES, 1637 McCORMICK BUILDING, CHICAGO, ILL.
New York Office, 1267 Broadway

The Heating and Ventilating Magazine

VOL. XII. No. 7

Contents for July, 1915

Page

Operating Data in Connection With Federal Buildings Under the Control of the Treasury Department..... *Nelson S. Thompson* 13

Space Requirements for Boilers of Various Types in School Buildings *T. W. Reynolds* 17

The Establishment of a Standard for Transmission Losses from Buildings of All Constructions ..... *Reginald Pelham Bolton* 19

Studies in Air Cleanliness. *George C. Whipple and Melville C. Whipple* 23
Tests to Determine Quality of City Air with Regard to Suspended Impurities and Distribution of Impurities.

Heating Data for Varying Conditions..... *James A. Donnelly* 28

National Association of Master Steam and Hot Water Fitters..... 35
Proceedings of Twenty-Seventh Annual Convention.

The Consulting Engineer..... 41
47—Air Cooling with Water.

Current Heating and Ventilating Literature 41

Legal Decisions 42
Modification of Contract by Correspondence and Payment.
No Liability for Negligence of Independent Contractor.
Covenant to Heat Premises—Slight Breach—Notice to Landlord.
No Liability for Negligence of Independent Contractor.

Features of Nineteen Typical Heating Franchises 43

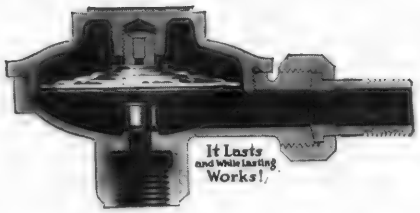
New Rules Promulgated by the New York State Industrial Commission 45

National Warm Air Heating and Ventilating Association 46

Correspondence 51
Figuring Size of Cooling Coils.

YEARLY SUBSCRIPTION, $1.00 **SINGLE COPIES, 10 CENTS**
Published monthly by the Heating and Ventilating Magazine Co.
1123 Broadway, New York

THE DUNHAM RADIATOR TRAP



and DUNHAM SYSTEMS of HEATING are

CONSIDERED STANDARD

"DUNHAM or equal" are the words found in the heating specifications of practically every large architect and engineer in the United States and Canada. This is perfectly natural when it is remembered that it was the Dunham trap that commercialized the hollow disc thermostatic principle in radiator trap construction.

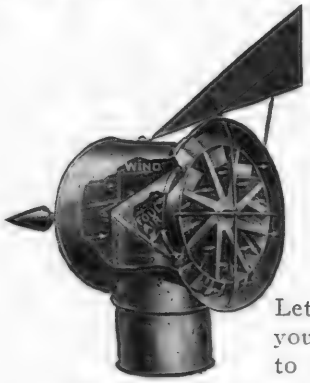
Our complete bulletin catalog H11 describes the Dunham line. Copy free upon request.

C. A. DUNHAM CO.

MARSHALLTOWN, IOWA

New York **Chicago** **San Francisco**

BI-CAL-KY



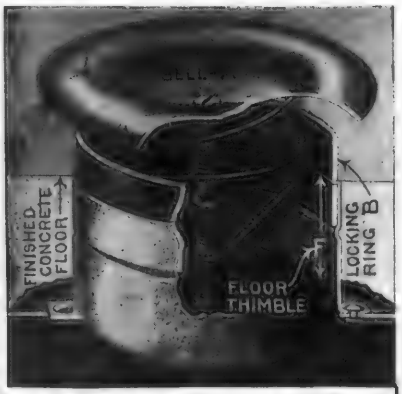
Ventilators Fan Suction

Power Bills?

Let the air that passes over your building furnish the power to ventilate it.

The **BICALKY** does this regardless of weather conditions or temperature. **WE GUARANTEE RESULTS. WRITE FOR INFORMATION.**

BICALKY FAN CO. Buffalo, N. Y.



The Bi-Cal-Ky Mushroom Vent Cap and Floor Thimble Used in Floors with Fan System in Theatres, Schools, Churches and Public Buildings

is far superior to any other cap and thimble on the market in simplicity, appearance and efficiency, as well as low in price.

The BI-CAL-KY cap acts as a combination damper and diffuser and the screw as a support, adjusting rod and lock for the cap. The cap is raised or lowered by simply turning the screw. This increases or decreases the opening through which the air escapes, thereby insuring an equal distribution of air at the periphery of the cap.

Note projection of cap which deflects the air towards the floor, thereby eliminating draughts. Compare with other caps.

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Eagle Roofing & Art Metal Works, 203 Cass St., Tampa, Fla.

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK JULY, 1915

Operating Data in Connection With Federal Buildings Under Control of the Treasury Department.

BY NELSON S. THOMPSON.

CHIEF MECHANICAL AND ELECTRICAL ENGINEER, OFFICE OF THE SUPERVISING ARCHITECT, WASHINGTON, D. C.

There are few engineers who have jurisdiction over the design, construction, and operation of mechanical and electrical equipment of buildings. This lack of intimate contact with the actual operating side of plants is a severe handicap to those who are not so fortunate, especially when engineers are called in to defend their recommendations for the installation of isolated power plants for buildings or industrial establishments. Their information on the subject of plant operation is purely theoretical and they have no bona fide records of their own to back up their calculations.

It is also true that only a few operating engineers are provided with means for accurately determining the coal and current consumption rates of the apparatus under their charge. The great majority are densely ignorant regarding the distribution of the steam generated in the boilers to the different portions of the equipment; i. e., the electric generating plant, the heating apparatus, etc., and consequently they have no records to produce, and have only a hazy idea of the situation when confronted by a good contract agent from the central station in an argument for or against shutting down the electric generating plants under their charge.

The office of the Supervising Architect is particularly fortunate in that it has exclusive jurisdiction over the design, construction, repair, and operation of the various buildings that it erects, and also has exclusive jurisdiction over the personnel of the operating forces, as well as over the purchase and use of all the supplies, etc., required for the various buildings. That this situation is correct and logical is borne out by the extraordinary economies that have been effected since steps were taken to place all these responsibilities under one technical bureau instead of entrusting them to several related or non-related bureaus, as was previously the custom in the Treasury Department, and as is still the custom in connection with school buildings, etc., in various cities in this country.

In order to obtain data upon the operation of Federal buildings under control of the Treasury Department, records are kept in some detail, especially in the larger buildings, and these records and data are studied, compared, and used as guides in the design of new projects.

All of the important buildings containing electric generating plants are equipped with coal scales, steam flow meters, water flow meters, CO_2 recorders, etc., and the chief operating engineers are provided with daily report blanks covering the coal consumption, ash removal, steam consumption of electric generating plants, etc. A few samples of the actual monthly reports follow:

CHIEF ENGINEER'S MONTHLY REPORT.

U. S. C. H. & POST OFFICE BUILDING AT BALTIMORE, MD. — MONTH OF DECEMBER, 1914

Fuel	189 1716/2240	Tons of coal,	at $3.35 per ton	$635 72
Water (make up water for boilers)	7,884	Cubic feet,	at $0.65 per 1,000 cubic feet	5 12
Ashes removed	26	Cubic yards,	at $0.50 per cubic yard	13 00
Boiler compound	15	Gallons,	at 100 cents per gallon	15 00
Cylinder oil	1	Gallon,	at 22½ cents per gallon	23
Engine oil	8	Gallons,	at 22 cents per gallon	1 76
Vacuum oil	2	Gallons,	at 23 cents per gallon	46
Gargoyle oil	21	Gallons,	at 23 cents per gallon	4 83
Waste	20	Pounds,	at 10 cents per pound	2 00
Cost of supplies for generating plant, packing tools, etc				.....
Cost of labor for entire plant				942 41
Cost of repairs to engines, dynamos, and switchboard authorized during month				.....
Cost of repairs to boiler plant authorized during month				.....
			Total	$1,620 53

SHERLOCK SWAN, Custodian (over.) H. W. ZOLLINGER, Chief Engineer

(Reverse Side.)

Cost of betterments to engines, dynamos, and switchboard authorized during month ..... $
Cost of betterments to boiler plant authorized during month 30 09

(1) Lighting, av'g voltage		Av'g amp.		Max. amp.		Min. amp.	K. W. H.	
(2) Power, av'g voltage		Av'g amp.		Max. amp.		Min. amp.	K. W. H.	
(3) Light and power, av'g voltage	240	Av'g amp.	424	Max. amp.	800	Min. amp.	200 K. W. H.	39,088

Note—Where separate meters are installed fill in lines Nos. 1 and 2. Where only one meter is installed fill in line No. 3.

Average steam pressure ..... 110 lbs.
Average temperature feed water ..... 208 degrees
Degree hours during month in which temperature is below 70 degrees ... 27,216.
Water evaporated per pound of coal fired ..... 10 lbs.
Steam consumed per K. W. H. in generating plant ..... 45 lbs.
Live steam used in heating apparatus ... 672 hours.

Steam consumed by: Generating plant	1,758,960	lbs.
Elevator equipment (hydraulic)	.....	lbs.
Auxiliary equipment (approximate)	500,000	lbs.
Heating and condensation	2,482,407	lbs.
Water actually evaporated	4,741,367	lbs.
Water consumed in blowing off boilers	110,980	lbs.
Water fed to boilers (meter readings)	4,852,347	lbs.

Remarks: .....

CHIEF ENGINEER'S MONTHLY REPORT.

U. S. CHICAGO POST OFFICE BUILDING AT CHICAGO, ILLINOIS. — MONTH OF FEBRUARY, 1915.

Fuel	672,690	Tons of coal,	at $3.02	per ton		$2,031 52
Fuel	Cubic ft. of gas,	tons of screenings	at	per 1,000 cubic feet; ton		.....
Water (make up water for boilers)	78,187	Cubic feet,	at .46875	per 1,000 cubic feet		36 65
Ashes removed	120¾	Cubic yards,	at .37	per cubic yard		44 68
Boiler compound	56	Pounds,	at .0136	cents per pound		76
Cylinder oil	26	Gallons,	at 25	cents per gallon		6 50
Engine oil	6	Gallons,	at 19	cents per gallon		1 14
Dynamo oil	...	Gallons,	at	per gallon		.....
Crank-case oil	...	Gallons,	at	per gallon		.....
Waste	...	Pounds,	at	per pound		.....
Cost of supplies for generating plant, packing tools, etc., 54 Gal. Cyl. Oil—46½ Gal. Eng. Oil						22 33
Cost of labor for entire plant						1,971 65
Cost of repairs to engines, dynamos and switchboard authorized during month						.....
Cost of repairs to boiler plant authorized during month; Misc. Supplies						250 00
				Total		4,365 23

.....Custodian. .....Chief Engineer.

(Over.)

(Reverse Side.)

Cost of betterments to engines, dynamos and switchboards authorized during month ..... $.....
Cost of betterments to boiler plant authorized during month .....

(1) Lighting, av'g voltage	115	Av'g amp.	1,079	Max. amp.	1,950	Min. amp.	400	K. W. H.	83,400
(2) Power, av'g voltage	230	Av'g amp.	325	Max. amp.	420	Min. amp.	100	K. W. H.	31,160
(3) Light and power, av'g voltage	.....	Av'g amp.	.....	Max. amp.	...	Min. amp.	Total	K. W. H.	114,560

Note—Where separate meters are installed fill in lines Nos. 1 and 2. Where only one meter is installed fill in Line No. 3.

Average steam pressure ..... 152 lbs.
Average temperature feed water ..... 180.1 degrees.
Degree hours during month in which temperature is below 70 degrees .. 23,078
Water Evaporated per pound of coal fired ..... 9.667 lbs.
Steam consumed per K. W. H. in generating plant ..... 48.1 lbs.
Live steam used in heating apparatus .. 197 hours

Steam consumed by: Generating plant	5,519,299	lbs.
Elevator equipment (hydraulic)	2,221,622	lbs.
Auxiliary equipment (approximate)	5,368,602	lbs.
Pneumatic tube engines	1,457,394	lbs.
Water actually evaporated	14,566,917	lbs.
Water consumed in blowing off boilers	93,296	lbs.
Water fed to boilers (meter readings)	14,660,213	lbs.

Remarks: .....

Total Expense for Month of—

February, 1914	$6,685 70
February, 1915	4,365 23
Saving for month	$2,320 47
Total saving for year	$15,984 78

CHIEF ENGINEER'S MONTHLY REPORT.

U. S. CUSTOM HOUSE BUILDING AT CINCINNATI, OHIO. MONTH OF DECEMBER, 1914.

Fuel	100,739	Tons of coal,	at $3.19	per ton		$321 36
Fuel	4,880,000	Cu. ft. of gas,	at .131412	per 1,000 cubic feet		641 29
Water (make up water for boilers)	15,631	Cubic feet,	at .80	per 1,000 cubic feet		12 50
Ashes removed (20.6 cu. yds. on hand)			at	per ton or cubic yard		.....
Boiler compound	12	Pounds,	at 8	cents per pound		96
Cylinder oil	43½	Gallons,	at 25	cents per gallon		10 88
Engine oil	46	Gallons,	at 19	cents per gallon		8 74
Dynamo oil	.....	Gallons,	at ..	cents per gallon		.....
Crank-case oil	.....	Gallons,	at ..	cents per gallon		.....
Waste	22	Pounds,	at 9¾	cents per pound		2 14
Cost of supplies for generating plant, packing tools, etc.						.....
Cost of labor for entire plant						983 90
Cost of repairs to engines, dynamos and switchboard authorized during month						.....
Cost of repairs to boiler plant authorized during month						.....
				Total		$1,981 77

.....Custodian. .....Chief Engineer.

(Over.)

(Reverse Side.)

Cost of betterments to engines, dynamos, and switchboard authorized during month; Separator and Trap authorized Oct. 10th.. $245 00
Cost of betterments to boiler plant authorized during month..... .....

(1) Lighting, av'g voltage....	115	Av'g amp.....	413.5	Max. amp..	610.97	Min. amp..	263.22	K. W. H..	35,390
(2) Power, av'g voltage	115	Av'g amp.....	146.45	Max. amp..	388.06	Min. amp..	72.9	K. W. H..	12,540
(3) Light and power, av'g voltage ...		Av'g amp.....	.....	Max. amp..	.....	Min. amp..	.....	K. W. H..	.....

Note—Where separate meters are installed fill in lines Nos. 1 and 2. Where only one meter is installed fill in Line No. 3.

Average steam pressure ..... 107 lbs.
Water evaporated per pound of coal fired..... 8 lbs.
Water evaporated per cu. ft. of gas fired..... .82 lb.
Average temperature feed water..... 202.13 degrees. Steam consumed per K. W. H. in generating plant..... 41.412 lbs.
Degree hours during month in which temperature is below 70 degrees...29,568 Live steam used in heating apparatus... 744 hours

Steam consumed by		
Generating plant	1,985,078 lbs.	Remarks: .....
Elevator equipment (hydraulic)	..... lbs.	.....
Auxiliary equipment (approximate)	217,000 lbs.	.....
Pneumatic tube engines	..... lbs.	.....
Water actually evaporated	5,806,840 lbs.	.....
Water consumed in blowing off boilers	230,678 lbs.	.....
Water fed to boilers (meter readings)	6,037,518 lbs.	.....

CHIEF ENGINEER'S MONTHLY REPORT.

U. S. POST OFFICE AND COURT HOUSE BUILDING AT SAN FRANCISCO, CAL. MONTH OF DECEMBER, 1914.

Fuel	28,790	Gallons of oil,	at $0.02164	per gallon		$621 86
Fuel, cubic feet of gas; tons of screenings			at	per 1,000 cubic feet; ton		.....
Water (make up water for boilers)	19,664	Cubic feet,	at meter rate	per 1,000 cubic feet		46 34
Ashes removed	.....	Tons or cu. yds.,	at	per ton or cubic yard		.....
Boiler compound	186	Pounds,	at 10	cents per pound		18 60
Cylinder oil	37	Gallons,	at 48	cents per gallon		17 76
Cup grease	6¾	Pounds,	at 15	cents per pound		1 01
Dynamo oil	3	Gallons,	at 35	cents per gallon		1 05
Crank-case oil	54	Gallons,	at 35	cents per gallon		18 90
Waste	28	Pounds,	at 9¾	cents per pound		2 73
Cost of supplies for generating plant, packing tools, etc. Packing Hyd. Elevators						4 00
Cost of labor for entire plant						745 66
Cost of repairs to engines, dynamos, and switchboard authorized during month						.....
Cost of repairs to boiler plant authorized during month						.....
				Total		$1,477 91

.....Custodian. .....Chief Engineer.

(Over.)

(Reverse Side.)

Cost of betterments to engines, dynamos, and switchboard authorized during month ..... $.....
Cost of betterments to boiler plant authorized during month..... .....

(1) Lighting, av'g voltage.....	224	Av'g amp..	310.7	Max. amp..	450	Min. amp..	100	K. W. H..	51,767.0
(2) Power, av'g voltage.....	224	Av'g amp..	114.6	Max. amp..	320	Min. amp..	50	K. W. H..	19,152.0
(3) Light and power, av'g voltage. ...		Av'g amp..	....	Max. amp..	...	Min. amp..	...	K. W. H..	70,919.0

Note—Where separate meters are installed fill in lines Nos. 1 and 2. Where only one meter is installed fill in Line No. 3.

Average steam pressure..... 125 lbs. Average temperature feed water..... 230 degrees.
Water evaporated per pound of oil fired..... 13.92 lbs. Steam consumed per K. W. H. in generating plant..... 41.1 lbs.
Degree hours during month in which temperature is below 70 degrees....15,912. Live steam used in heating apparatus....None.

Steam consumed by		
Generating plant	2,916,129.1 lbs.	Remarks: .....
Elevator equipment (hydraulic)	..... lbs.	.....
Auxiliary equipment (approximate)	204,089.1 lbs.	.....
Pneumatic tube engines	..... lbs.	.....
Water actually evaporated	3,120,218.2 lbs.	.....
Water consumed in blowing off boilers	40,185.6 lbs.	.....
Water fed to boilers (meter readings)	3,160,403.8 lbs.	.....

These monthly reports from the large buildings are turned over to one of the mechanical and electrical engineers of the office, who analyzes them, compares one with another, and calls to the attention of the chief mechanical and electrical engineer any matters that need attention.

Each year these monthly reports are tabulated for ready comparison, as illustrated by Table I.

DEPARTMENT NOT PREJUDICIAL AS REGARDS ISOLATED PLANTS AND CENTRAL STATIONS.

The department holds no brief for the isolated plant versus the large central plant, but analyzes each individual building on its merits and chooses the most economical course in the matter of supplying electricity and light.

To compete with the large central plants it is absolutely necessary to install engines and generators of the highest economy consistent with a reasonable first cost, and this has led to the adoption of the high-speed, non-release, Corliss type of four-valve engine with a low percentage of clearance and close regulation, because electric elevators are operated from the same bus-bars as the lighting system, and no flickering of the lamps is tolerated.

The engines and generators are purchased on the evaluation system, which means, in effect, that the government is willing to make a substantial investment in steam or current producing apparatus if it can be demonstrated by test that the savings per annum of the costly apparatus will pay a dividend of 13% on the additional investment which is always required when the first cost of an economical steam engine is compared with the first cost of an engine that is not economical and is marketed and exploited merely as an engine.

With the foregoing data at hand the actual cost of operating the electric generating plant in a building is known at once, and the question of purchasing current and shutting down the plant can be discussed intelligently. It may be stated in passing that the actual cost records are very disconcerting to the central station solicitor, who generally proceeds to assign values to steam consumption of engines, water evaporating capacity off boilers, etc., with considerable disregard of the facts as found in Federal buildings.

COST OF LABOR OFTEN A DETERMINING FACTOR.

It will be noted that the cost of labor in connection with the buildings given above as examples is very high as compared with the cost of labor in commercial plants, and it is worthy of note that by careful operation and close supervision it has been possible to compete with the large central stations except where certain influences have made the labor item outrageously excessive. In the plants which have been shut down in recent years the cause of the change has been that the engineering employees have over-reached themselves in the matter of hours of labor, rates of pay, etc., coupled with the fact that the plants themselves were old and generally low in all-around efficiency.

The central stations are each year making lower rates and approaching the point where the cost of purchasing current will be equal to or less than the cost of operating the isolated plants, and it behooves those interested in the maintenance of an isolated plant to keep up to date and effect every possible economy.

Table II. is introduced to give an idea of the annual consumption of electricity for power and light in certain large and small Federal buildings. It is interesting to compare the current consumption in Federal buildings (which are 24-hour buildings) with commercial buildings as reported by the Wisconsin Public Service Commission:

Class of building.	K.W.H. per annum per K.W. of full connected load (lighting only).
Churches	101
Farms	183
Laundries	185
Lodge halls	194
Schools	236
Residences	239
Theaters	367

* Since the preparation of the foregoing table the electric generating plants in Brooklyn and New York City have been shut down, and current is now purchased from the Edison Company, with the result of an annual saving in Brooklyn of approximately $8,000 per year, and in New York City of approximately $12,000 per year.

Offices	400
Livery stables	402
Stores	471
Hotels	505
Signs	551
Bowling alleys	809
Depots	937
Saloons	955
Industrial establishments	1,069
Restaurants	2,209

Federal buildings.	K.W.H. per annum per K.W. full connected lighting load.	K.W.H. per annum per H.P. of full connected power load.
Small buildings up to 250,000 cubic contents.	1,200	*350
250,000 to 500,000 cubic contents	1,200	160
500,000 to 1,000,000 cubic contents	1,200	200
1,000,000 to 10,000,000 cubic contents	3,300	400

* All stamp canceling machines.

The foregoing data are extremely valuable in estimating the operating characteristics of a new building which is being designed, at which time it is essential that the maximum demand, full connected load, annual K. W. H. consumption, heating requirements, labor force, etc., be accurately determined, in order that an intelligent comparison may be made with the rates quoted by the local electric company to see whether the installation of an isolated electric light plant would be justified.

It may be stated roughly that the full connected power and lighting load will not exceed 1½ watts per square foot of floor space of the entire building; that the maximum demand will not exceed 50% of the full connected lighting and power load; and that the electric current consumption per annum for power and light will not exceed 2 K. W. H. per square foot of floor area in a modern building with ample and well-placed windows.

WHEN ISOLATED PLANTS ARE PREFERABLE.

Generally speaking, an isolated plant begins to be feasible in a Federal building where the full connected load is 150 K. W. or more, and where the annual current consumption is 200,000 K. W. H. or more per annum and the cost of current from the central station exceeds 4 cents per K. W. H.

In commercial buildings, an authority states that in and around New York City where the cost of purchased current will approximate 5 cents per K. W. H. an isolated plant should be given consideration when the annual current consumption is 60,000 K. W. H. or more.

A leading mechanical and electrical engineer of New York City has stated that in a given building where there are two or more electric elevators and 1,000 or more lighting sockets (50-watt rating) an isolated plant becomes a possibility when the cost of purchased current is 5 cents per K. W. H. or greater.

(In the August issue Mr. Thompson will present another interesting table of operating statistics for a number of Federal buildings in Washington, D. C., supplemented by an account of the procedure followed in a city which has a central heating plant.)

Space Requirements for Boilers of Various Types in School Buildings

By T. W. Reynolds.

In the consideration of space requirements for ventilation plants in school buildings, one of the most important items is that involving the space or cubic contents allotted to the boilers. As the cost of such buildings is usually estimated at so much per cubic foot, the importance of boiler selection, in its relation to the space required, may well be considered.

The following comparison of a well-known make of cast-iron sectional smokeless downdraft boiler (set either singly or in duplicate with space between), with an equally well-known make of brick set smokeless downdraft firebox boiler having an equal rating (set singly, in battery or in two units with space between), is interesting when the practical merits of the boilers are considered, aside from other issues.

The overall outlines of the boilers are

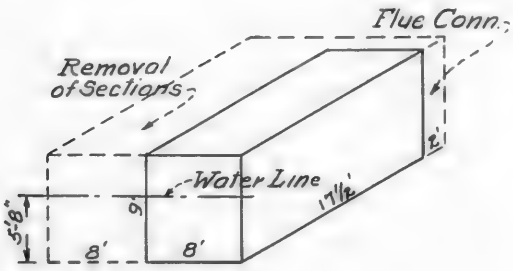


FIG. 1—TYPICAL INSTALLATION OF SECTIONAL CAST-IRON BOILER.

shown in full lines with dotted lines denoting the necessary space required for the flue connection and for the removal of boiler sections as in the sectional boiler, also the removal of water grate bars and withdrawal of tubes as peculiar to the steel boiler.

A comparison of the water line in each make of boiler is equally interesting for the returns of a gravity steam heating system must necessarily be 18 in. or preferably 3 ft. higher than the water line in the boiler. This may mean more or less excavation for the depression of the boiler room floor, with a corresponding increased cost according to local conditions.

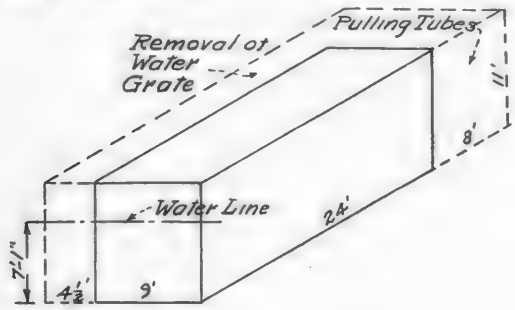


FIG. 2—TYPICAL INSTALLATION OF SINGLE STEEL BOILER.

The use of the cast-iron boiler is precluded when high steam pressures are required, but where low pressure heating systems are installed it may well be used, as the cost is less.

Referring to the sketches, Fig. 1 represents a single cast-iron boiler having a capacity equivalent to 15,000 sq. ft. of direct radiation, the largest of this type made. Where head room is not available or interference with overhead steam piping is to be avoided, the removal of sections for repairs cannot be affected by lifting upwards, but they must be withdrawn from either side as shown by the clear space of 8 ft. For the proper connection of boiler to flue, with provision for damper operation, an additional 2 ft. must be provided at the rear. Note the total cubic contents of 2,808 cu. ft., and the water line of 5ft. 8 in. The water grate is so arranged that it may

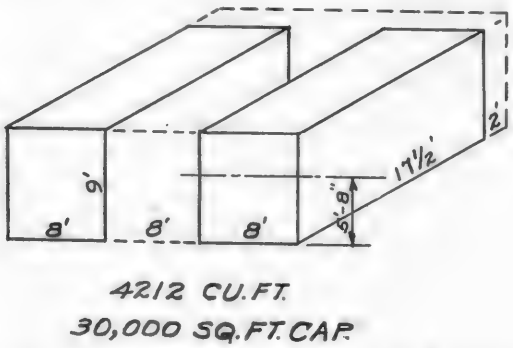


FIG. 3—SPACE REQUIREMENTS FOR TWO CAST-IRON BOILERS.

easily be removed through the firing doors.

In direct comparison refer to Fig. 2, typical of a single steel boiler having an equal capacity. For the removal of the bar in the water grate 4½ ft. at the left hand side is required, while the withdrawal of tubes requires an additional 8 ft. at the rear. The total cubic feet required is 4,930, while the water line is 7 ft. 1 in. The tubes cannot be with-

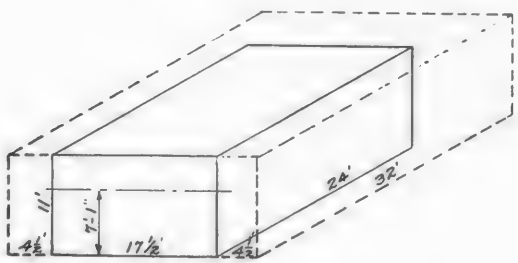


FIG. 4—SPACE REQUIREMENTS FOR TWO STEEL BOILERS.

TABLE 1—Operating Statistics fo

BUILDING		BALTIMORE P.O. & C.T.H.	BOSTON P.O. & SUB. TR.	BROOKLYN P.O.	CHICAGO P.O.	CINCINNATI P.O.	DETROIT P.O.	INDIANAPOLIS P.O.	KANSAS CITY, MO. P.O.	MILWAUKEE P.O.	A
BOILERS	NO.	5	8	3	5.	6	8.	4.	6	8	
	H.P.	700.	1000.	900.	1500.	750.	400	600.	450.	600.	
GEN'S	NO.	3.	4.	3.	4	5.	—	—	3.	—	
	HP ENG.	507.	480.	280.	980.	675.	—	—	320.	—	
	KW. GEN.	325.	300.	175.	600.	425.	—	—	200.	—	
MISC.	NO.	—	—	—	—	—	2	1.	2.	6.	
ENG.	HP	—	—	—	—	—	20	15	50	100.	
STEAM	NO.	3.	6.	4.	13.	4	6	4.	7.	8.	
PUMPS	HP.	15.	60.	20	800	18	315	39.	84.	330.	
STEAM	NO.	—	—	—	—	—	—	—	—	—	
ELEV	HP.	—	—	—	—	—	—	—	—	—	
HEATING SURFACE SQ FT.	DIR. RAD	20,000.	30,000	13260.	45,000.	60000.	20864.	20,933	16,377.	11,680.	
	IND. RAD	—	—	5924	45,000	—	9,380.	3,820	6,519.	11,945.	
	EQUIV. DIR	20,000.	30,000.	33,032.	180,000	60,000.	39,627.	32,393	35,934.	47,515.	
	SYSTEM	Steam	Steam	Steam	Steam.	Hot Water.	Steam	Steam	Steam.	Steam.	
ELECTRIC POWER K.W.	ELEV. MO.	148.	80.	55	60.	50.	26.	54.	68	—	
	PUMP "	44.	—	15	48.	54	—	18.	14	—	
	MISC "	41.	80.	25.	580.	36.	19.	60.	57.	7.	
	COND LOAD	233.	160.	95.	688.	140.	45.	132.	139.	7.	
	MAX. DEM.	60.	84.	35.	140.	51.	15.	50.	50.	5.	
	MIN. "	5.	6.	5.	9.	2.	0.	2.	2.	0.	
ELECTRIC LIGHTING K.W.	LIGHTING	131.	110.	84.	330.	95.	52.	67.	70.	83.	
	MISC.	19	5.	6.	30.	10.	3	14.	7.	9.	
	COND LOAD	150	115.	90.	360.	105.	62.	81.	77.	92.	
	MAX. DEM.	85.	90.	50.	310.	59.	31.	40.	40	40.	
	MIN. "	10.	26.	11.	33.	19.	4	8.	7.	9	
ELECTRIC CURRENT K.W.	COND LOAD	383.	273.	195	1048.	245.	123 gas engines 107.	213.	216.	99.	
	MAX. DEM	120.	174.	70.	420.	107.	40.	85.	81.	40.	
	MIN. "	15.	32.	16.	42.	21.	4	10	9.	8.	
	ANNUAL K.W.H.	367,814.	614,987.	385,772.	1,534,670.	416,250.	44,905 K.W.H. 10,139,000 Cu. Ft. Gas 18.8 K.W.H. per 1000 Cu. Ft. Gas per hr.	152,397.	188,754.	105,020.	
	AVER. DEM	42.	70.2	44.1	175.	47.3	17.4	17.4	21.6	12.	
CONTENTS, CU. FT.		H.D. 3,886,000. CH. STACK 3,068,000. P.O. 157,000 CHIMNEYS 103,200.	5,098,100.	3,721,600.	11,564,000.	7,883,500.	4,000,000.	4,215,400.	2,534,000.	3,977,000.	
FLOOR AREA SQ. FT.			206,900.	165,000.	760,000.	192,700	182,000	192,500	129,000.	183,800.	
CURRENT COST		——	——	——	——	——	Current 3796.18 Gas 598.32	3,047.94	——	Current 3,312.86 Gas 26.27	
COAL	TONS	1,372.164	3,187.7	4,487.794	8182.922	41,337,900 cu ft gas 92.8 tons coal	1,639.147	907.5	7,010.73 bbl. oil	938.567	
	COST	4361.47	12,012.99	12,334.34	24911.86	5,576.54	4,805.41	2,192.38	6,378.39	3,003.00	
WATER	CU. FT.	41,630.	1,073,484.	1,474,185.	2,032,513.	335,000.	—	47,607.	5363.6	——	
	COST	27.06	1,288.17	1,474.19	1,067.07	259.69	——	21.37	4.31	——	
ASH REMOVAL	CU. YDS.	211.42	906.	2,639.2	2,013.	7.	521.	452.	——	184.25	
	COST	105.71	516.42	1,319.60	755.38	3.50	208.40	178.40	——	112.34	
OIL	GALLONS	527.	1,457.	1,655.5	1639.5	1,171.375	188.5	101.25	895.25	159.	
	COST	113.31	329.94	302.61	412.38	277 22	44.43	25.30	245.75	37.12	
WASTE	POUNDS	318.	1,519.	806.	2017.	565.5	32.25	45.	206.25	128.375	
	COST	30.71	141.50	77.13	199.14	54.62	2.90	4.37	19.59	14.59	
OTHER SUPPLIES		62.69	82.68	155.47	2,807.36	26.78	30.50	0.00	43.96	23.26	
REP. TO GEN. PLANT		120.57	0.00	511.25	450.00	0.00	0.00	0.00	36.25	64.20	
REP. TO BOILERS		32.49	67.50	149.47	95.00	49.90	0.00	141.48	0.00	463.45	
LABOR		12,218.75	21,096.25	18,645.00	28,457.50	13,153.75	8,083.13	5,977.50	8,663.75	6,763.75	
TOTAL COST		17,072.76	35,525.45	35,969.06	59,155.69	19,402.00	22,856.27	11,588.74	15,392.00	13,821.46	
ENGINEERING PERSONELL		1 Chief Eng @ 1400.00 3 Asst Eng @ 1200.00 1 Eng Helper @ 1000.00 1 Electrician @ 1000.00 3 Firemen @ 2.50 p d 1 Firm Helper @ 2.25 p d 2 Coal Passers @ 2.00 p d	1 Ch. Eng @ 2500.00 1 1st Asst Eng @ 1500.00 2 Asst Eng @ 1200.00 2 Eng Helpers @ 1000.00 1 Electrician @ 1200.00 3 Elec Helpers @ 1000.00 6 Firemen @ 2.50 p.d. 1 Firm Helper @ 2.25 p.d. 3 Coal Passers @ 2.00 p.d.	1 Ch Eng @ 1600.00 1 1st Asst Eng @ 1400.00 2 Asst Eng @ 1200.00 2 Eng Helpers @ 1000.00 1 Electrician @ 1200.00 11 Firemen @ 3.00 p.d.	1 Chief Engr @ 2200.00 1 1st Asst Eng @ 1800.00 3 Asst Eng @ 1200.00 5 Eng Helper @ 1000.00 2 Electricians @ 1200.00 1 Wireman @ 900.00 3 Oilers @ 840.00 7 Firemen @ 2.50 p.d. 3 Fire Help @ 2.00 p.d.	1 Ch. Eng @ 2000.00 3 Asst Eng @ 1200.00 1 Eng Helper @ 1000.00 3 Firemen @ 2.35 p.d. 3 Fire Helpers @ 2.00 p.d. 1 Electrician @ 1000.00 1 Wireman @ 900.00	1 Ch Eng @ 1800.00 3 Asst Eng @ 1000.00 1 Eng Helper @ 900.00 3 Firemen @ 2.25 p.d. 1 Coal Pass Eng 1.75 p.d.	1 Ch. Eng. @ 1800.00 1 Asst Eng @ 1200.00 2 " @ 1000.00 3 Firmen 7 mo 3.00 p.d	1 Ch. Eng @ 1600.00 3 Asst Eng @ 1200.00 1 Eng Helper @ 1000.00 3 Firemen @ 2.25 p.d	1 Ch. Eng @ 1400.00 2 Asst Eng @ 1000.00 1 Eng Helper @ 900.00 3 Firemen @ 2.25 p.d
COST ELECTRICITY (NON WITHOUT INTEREST & DEP.)		.014.	.0141	.023	.0084	.0126	.04	.02	.0206	.03155	
COST STEAM (NON WITHOUT INT. & DEP.)		.308	.345	.338	.276	.284	.225	.315	.307	.32	
POWER & LIGHT PER CU. FT.		.00074	.0017	.00238	.0011	.00066	.00293	.00072	.00154	.00128	
HEATING PER CU. FT.		.00312	.00416	.00554	.0034	.0018	.00278	.00203	.00453	.00228	
TOTAL COST " " "		.00386	.00586	.00792	.0045	.00246	.00571	.00275	.00607	.00356	
POWER & LT. PER SQ. FT.		.0166	.042	.054	.017	.0272	.0644	.0158	.0302	.0271	
HEATING PER SQ. FT.		.0763	.1023	.125	.052	.0735	.0612	.0444	.0891	.0481	
TOTAL COST " " "		.0929	.1443	.179	.069	.1007	.1256	.0602	.1193	.0752	
		$5672.40 STEAM SOLD TO P TUBES	$6464.64 STEAM SOLD TO P TUBES		$6832.52 STEAM SOLD TO P TUBES.						

Statistics for Certain Large Federal Buildings.

	Milwaukee P.O.	New Orleans Cu. H.	New York Ap. W.H.	New York Ch'h P.O.	Omaha P.O.	Philadelphia Ch'h P.O.	Pittsburg P.O.	San Francisco P.O. & Ct. H.	St. Louis Cu. H.	St. Louis New P.O.	Totals
	8	2	5	4	5	5	4	5	5	4	92.
	600.	400.	1,039.	2000	400.	600.	480.	650	1,000.	600	14,069.
	—	3	4	5	—	4.	3.	4	4	—	49.
	—	320.	582.	833.	—	750.	495.	720.	400.	—	7,342.
	—	200.	388.	555.	—	475.	300.	450.	250	—	4643.
	6.	—	4	—	—	—	—	—	—	—	15.
	100.	—	105.	—	—	—	—	—	—	—	290.
	8.	4.	10	—	5.	3.	2.	6.	1.	3.	89.
	330.	20.	166.	—	165.	25.	10.	18.	5.	40.	2,130.
	—	—	15.	—	—	—	—	—	—	—	15.
	—	—	675.	—	—	—	—	—	—	—	675.
	11,680.	11,526.	50,000.	21,866.	18,202.	32,891.	16,480.	9,980.	47,500.	12,047.	460,606.
	11,945.	—	—	3,000.	3,329.	8000.	2,816.	3530.	9000.	10,350.	123,608.
	47,515.	11,526.	50,000.	30,866.	28,179.	56,891.	24,928.	20,570.	74,500.	43,097.	849,050.
	Steam.	Steam.	Steam	Steam	Steam.	Steam.	Steam	Steam	Hot Water	Steam.	—
	—	54.	100.	131.	—	108.	55.	117.	66.	12.	1,184.
	—	26.	—	94.	—	28.	—	33.	6.	25.	410.
	7.	20.	12.	236.	15.	56.	12.	150.	24.	308.	1,738.
	7.	100	112.	466.	15.	192.	67.	300.	96.	345.	3,332.
	5.	25.	45.	180.	10.	60.	40.	94.	55.	70.	1,163.
	0.	2.	0.	5.	6.	10.	5.	5.	0	4.	62.
	83.	82.	185.	235.	32.	140.	125.	158.	116.	130.	2,232.
	9.	18.	12.	30.	4.	4.	5.	7.	10.	20.	213.
	92.	100.	197.	265.	36.	144.	130.	165.	126	150.	2,445.
	40.	65.	146.	222.	18	116.	60.	135.	82.	94.	1,683.
	8	27.	13.	67.	2.	50.	10.	17.	22.	19.	353.
	99.	200.	309.	731.	51.	336.	197.	465.	222.	495.	5,777.
	40.	82.	190.	367.	25.	140.	92.	212.	130	141.	2,516.
	8.	31.	13.	77.	2.	60.	15.	22	22	23	422.
	103,020.	441,478	356,773.	1,362,160.	36,649.	700.441.	317,322.	659,203.	383.761.	512,232.	8,649,921.
	12.	504	40.7	155.5	4.2	80.	36.2	75.3	43.8	58.5	985.
	3,977,000.	6,085,000.	9,700,500.	8,334,200.	3147,300.	7.378.900.	3,276,000.	4,166,500.	5,885,000.	4,769,500.	99,466,500.
	183,800.	304,000.	502,700.	299,100.	143,600.	204,700.	126,000.	216,500.	161,500.	167,200.	4,294,400.
	Current 3,312.86 Gas 31.39	—	—	—	Current 2,026.39 Gas 79.20	—	—	—	—	9,271.61	Current 21,496.98 Gas 410.01
	938.567	1,353.45	5,203.514	6299.55	1,084.053	3.627.98	39,374.200 cu.ft gas	329,073 gal oil	2,879.723	1,162.779	44,369 gal oil 1,000 cu. ft. gas 1,000 lbs. coal
	3.003.00	4,724.67	14,505.69	18058.98	5,160.10	8,780.45	6,094.57	6,243.19	6093.71	2,397.06	147,634.75
	—	436,269.43	1,263,012.	1,546,851.	60,164.5	487,409.	391,098.	295,645.	390,450.	4,861.	9,885,342.93
	—	267.98	1,263.01	1,346.85	89.40	146.22	347.68	667.17	234.27	4.74	8,709.18
	184.25	200.	2,082.	2,542.	395.5	1,432.17	—	—	1,053.8	279.54	14,918.88
	112.34	0.00	755.44	827.66	98.88	535.66	—	—	415.62	113.39	5,946.90
	159.	662.	4,038.35	2,197.67	69.375	631.5	816.5	849.625	521.	33.55	17,624.145
	37.12	169.69	744.92	393.19	22.78	143.35	192.82	344.98	99.33	7.93	3,907.00
	128.375	210.	1,546.5	1,701.5	50.	1,464.	190.	279.5	462	92.	11,622.875
	14.59	18.90	139.19	164.25	5.50	98.82	17.10	27.95	42.65	8.28	1,067.14
	23.26	0.90	385.76	265.50	6.38	113.75	46.09	297.00	38.50	37.00	4,423.58
	64.20	189.55	1,604.90	1,797.48	136.48	10.91	0.00	48.00	0.00	0.00	4,988.59
	463.45	1,345.37	1,503.20	2,024.93	750.96	140.57	51.00	361.00	491.42	52.50	8,720.24
	6,763.75	10,228.75	23,135.00	30,090.00	6,493.75	18,437.50	7,963.75	13,385.00	16,570.00	9671.25	259,024.38
	13,821.46	16,944.76	44,037.06	55,168.84	14,870.82	28,407.23	14,713.01	21,374.29	23,985.50	21,563.76	471,848.70
	1 Ch. Eng @ 1400.00	1 Ch. Eng @ 1800.00	1 Ch. Eng. @ 1600.00	1 Ch. Eng @ 2500.00	1 Ch. Eng @ 1400.00	1 Ch. Eng @ 2000.00	1 Ch. Eng @ 1600.00	1 Ch. Eng @ 2000.00	1 Ch. Eng @ 2200.00	1 Ch. Eng @ 1600.00	91 [illegible] 114,400.00
	2 Asst. Eng @ 1000.00	3 Asst. Eng @ 1200.00	3 Asst. Eng @ 1200.00	1 1st Asst. Eng @ 1400.00	1 Asst. Eng @ 1000.00	3 Asst. Eng @ 1200.00	3 Asst. Eng @ 1000.00	3 Asst. Eng @ 1200.00	3 Asst. Eng @ 1200.00	1 1st Asst. Eng @ 1400.00	11 Dyn. Tenders 10,935.00
	1 Eng Helper @ 900.00	1 Eng Helper @ 1000.00	1 Eng Helper @ 1100.00	2 Asst. Eng @ 1200.00	1 Eng Helper @ 900.00	2 Eng Help @ 1000.00	1 Eng Helper @ 900.00	3 Electricians @ 1000.00	3 Eng Help @ 1000.00	1 Asst. Eng @ 1200.00	22 Elec 24,100.00
	3 Firemen @ 2.25 pd	1 Electrician @ 1000.00	1 Electrician @ 1200.00	3 Dyn. Tenders @ 1000.00	3 Firemen @ 2.25 pd 6 mos	1 Electrician @ 1200.00	3 Firemen @ 2.25 pd	1 Elec. Mech. @ 1500.00	1 Electrician @ 1200.00	1 Eng Help @ 1000.00	118 Boiler & Engineers 109,084.38
		3 Fireman @ 2.00 pd	1 Dyn. Tender @ 1200.00	3 Wipers @ 1300.00	2 Coal passers @ 2.00 pd			4 Firemen @ 2.25 pd	3 Firemen @ 2.50 pd	1 Fireman @ 2.50 pd	
		1 Fourth Helper @ 1.75 pd	1 Oiler @ 3.00 pd.	1 " @ 1000.00		6 Firemen @ 2.50 pd			2 Fmn Help @ 2.25 pd	1 Fmn Help @ 2.25 pd	
			10 Firemen @ 2.00 pd	10 Firemen @ 2.00 pd		2 Fmn Help @ 2.25 pd			3 Coal Pass @ 2.00 pd	8 mos 5 Firemen @ 2.25 pd	
			3 Coal passers @ 2.00 pd	8 Coal Passers @ 2.00 pd		3 Oilers @ 2.40.00					
	.03155	.0126	.0292	.0168	.0553	.0159	.013	.0081	.0204	.0181	All Kinds .0233 Steam .0155 Elec.
	.32	.326	.367	.345	.517	.269	.223	.293	.311	.372	.311
	.00128	.00091	.00108	.00274	.00131	.00151	.00126	.00128	.00133	.00195	.00141
	.00228	.00187	.00346	.0032	.00341	.00234	.00323	.00385	.00212	.00260	.00300
	.00356	.00278	.00454	.00594	.00472	.00385	.00449	.00513	.00345	.00455	.00441
	.0271	.0183	.0207	.0766	.0286	.0345	.0328	.0246	.0485	.0654	.03252
	.0481	.0374	.0668	.089	.0749	.0343	.084	.0741	.0772	.0742	.06952
	.0752	.0557	.0875	.1656	.1035	.1338	.1168	.0987	.1257	.1296	.10204
				$5624.64 Steam sold to P. Tubes.					$3,698.42 Steam sold to P. Tubes		All Kinds .1114

TABLE 2—Operating Characteristics of Certain Large

Building Name	Cu. Ft. Contents	Sq. Ft. of Lighted Area				No. of Employes					Sq. Ft. per Employee	Lighting				
		P. O. Workroom	Lobby	Other spaces	Total	P. O. Day	P. O. Night	General Day	General Night	Total		K.W. Connected	Watts per Sq. Ft.	K.W. Demand	K.W.H. per Annum	K.W. Sq.
Chicago, P.O.	11,564,000.	359,750.	22,950	377,300	760,000	1630	1200	1600	400	4830	157	360	0.47	310	1,200,000	1.
Cincinnatti, P.O.	7,883,500.	34,094	20,045	138,561	192,700	165	72	257	17	511	377	105	0.54	59	305,000	1.
Philadelphia, P.O.	7,378,900.	40,085.	9,607	156,008	204,700	587	484	401	25	1497	137	144	0.70	116	570,000	2.
New York, Cf. H.	8,334,200.	98,300	7,400	193,400.	299,100	1025	572	411	42	2050	146	265	0.89	222	989,000	3.
St. Louis, Cu. H.	5,885,000.	46,265	9,810	105,425	161,500	679	266	285	16	1246	130	126	0.78	82	360,000	2.
Buffalo, P.O.	5,052,000.	22,062	8,036	177,862.	209,960	312	133	287	59	791	265	96	0.46	60	209,000	1.
Average	7,683,000.				304,500					1821	167	183	0.60	141	605,500	1.
Jacksonville, Fla. P.O.	1,114,000	8,668	3,071	32,644	44,383	124	21	94	2	241	184	24.1	0.54		44,282	1.
Topeka, Kans. P.O.	1,090,000	9,066	2,920	21,732	33,718	88	16	53	2	159	212	20.2	0.60		21,902	0.
St. Joseph, Mo. P.O.	1,068,000	8,373	2,312	25,148	35,833	80	17	28	4	129	278	14.5	0.41		13,381	0.
Cedar Rapids, Ia. P.O.	1,061,000	5,526	2,292	25,134	32,950	46	8	25	2	81	407	23.8	0.72		24,280	0.
Ft. Worth, Tex. P.O.	1,028,000	7,900	3,300	8,000	19,200	105	25	35	0	165	116	11.0	0.57		20,093	1.
Chattanooga, Tenn. P.O.	1,025,000	7,885	2,445	21,015	31,345	54	13	42	2	112	281	12.5	0.25		30,080	1.
San Antonio, Tex. P.O.	1,016,000.	7,991	3,126	27 344	38,461	94	24	33	9	160	240	20.0	0.52		16,685	0.
Mobile Ala., Cu. H.	1,010,000	6,248	2,047	25,788	34,090	55	9	40	1	105	324	10.4	0.31		20,267	0.
Galveston, Tex. P.O.	1,007,000	5,165	1,691	24,787	31,690	53	3	5	0	61	520	10.7	0.34		18,950	0.
Wheeling, W.Va. P.O.	980,000	6,729	2,545	30,436	39,710	52	13	78	3	146	270	21.0	0.53		27,414	0.
Peoria, Ill. P.O.	977,000	9,807	4,000	32 855	46,660	99	13	40	1	153	305	35.0	0.75		24,561	0.
Average	1,035,000				35,270					137	258	18.5	0.53		23,809	0.
Columbia, S.C. P.O.	522,000	4,480	1,120	11,232	16,830	45	9	41	5	100	168	14.6	0.87		14,220	0.
Rock Island, Ill. P.O.	518,000	6,071	1876	19,923	27,870	34	14	52	13	113	246	11.8	0.43		11,711	0.
Ft. Dodge, Ia. P.O.	515,000	3,911	1342	17,776	23,030	22	4	29	0	55	420	10.7	0.47		4,302	0.
Lexington, Ky. P.O.	515,000	6,529	2,094	13,192	21,760	55	3	23	1	82	265	9.9	0.46		20,268	0.
Boise, Idaho, P.O.	510,000	2,774	1,754	20,592	25,120	32	8	54	2	96	261	13.3	0.53		11,362	0.
Harrisburg, Pa. P.O.	507,000	3,478	1500	13,252	18,230	26	27	38	7	98	186	13.9	0.76		20,135	1.
Pensacola, Fla. P.O.	506,000	3,200	1600	14,700	19,500	32	8	22	0	62	315	8.0	0.41		12,499	0.
Jackson, Miss. P.O.	505,000	3,917	2541	22 920	29,400	27	5	25	1	58	506	9.0	0.31		12,823	0.
Greensboro, N.C. P.O.	505,000	3,484	2033	12 511	18,030	30	6	26	1	63	286	4.5	0.25		12,108	0.
Leavenworth, Kan. P.O.	504,000	4,790	1,366	18468	24,600	28	3	20	2	53	464	5.5	0.22		12,511	0.
Fargo, N.D. P.O.	503,000	2,980	1,540	11 801	16,321	39	6	27	1	73	224	8.3	0.51		9,395	0.
Asheville, N.C. P.O.	496,000	4,472	1,790	14 705	20,965	34	6	18	1	59	354	11.3	0.54		7,164	0.
Burlington, Vt. P.O.	495,000	4,090	1,540	16 970	22,600	35	7	26	2	70	323	11.5	0.51		7,204	0.
Average	508,000				21,900					75	292	9.4	043		11,977	0.
Kokomo, Ind. P.O.	253,000	3,130	1,220	5,630	9,980	31	4	3	1	39	256	4.4	0.44		3,034	0.
Petersburg, Va. P.O.	253,000	1,856	990	5,376	8,220	29	5	11	2	47	175	6.9	0.84		5,843	0.
Pine Bluff, Ark. P.O.	251,000	3,821	1,142	4,046	9,000	33	4	7	1	45	200	4.4	0.49		7,142	0.
Ithica, N.Y. P.O.	251,000	2,656	1,354	5,625	9,635	26	10	2	2	40	240	4.5	0.47		4,862	0.
Bloomington, Ill. P.O.	250,000	3,192	934	5,906	10,030	33	9	5	1	48	208	4.7	0.47		11,569	1.
New Albony, Ind. P.O.	249,000	2,442	1,135	7,857	11,434	24	2	7	2	35	326	2.2	0.19		4,051	0.
Athens, O. P.O.	249,000	2,755	991	11,551	15,300	22	2	3	0	27	570	5.5	0.36		5,582	0.
Monroe, La. P.O.	248,000	1,959	1,136	3,639	6,734	17	2	0	0	19	354	6.3	0.93		5,347	0.
Meadville, Pa. P.O.	247,000	2,254	1,803	7,692	12,020	34	4	0	0	38	316	9.0	0.75		7,798	0.
Muncie, Ind. P.O.	246,000	3,180	1,220	2,587	7,000	46	3	2	2	53	132	3.4	0.48		5,367	0.
Average	250,000				9,935					39	254	5.13	0.52		6,060	0.

s of Certain Large and Small Federal Buildings.

	Lighting						Power					Total Light and Power.	
ts Sq. Ft.	K.W. Demand	K.W.H. per Annum	K.W.H. per Sq. Ft.	K.W.H. per Employee	K.W.H. per K.W. Connected load Annum	Day	Motor H.P. Connected	K.W. Demand	K.W.H. per Annum	K.W.H./H.P. per Annum	K.W.H./K.W. connected ld. per An.	K.W. Demand	K.W.H./K.W. connected ld. per An.
27	310	1,200,000	1.58	248.	3,333	9.1	925	140	335,000	362	487	420	1,766
54	59	305,000	1.58	597.	2,900	8,0	188	51	109,000	580	780	107	1,770
70	116	570,000	2.78	380	3,960	10.7	257	60	130,000	506	678	140	2,080
99	222	989,000	3.30	480	3,730.	10.2	625	180	343,000	549	735	367	1,820
78	82	360,000	2.23	289	2,860	7.8	128	55	24,000	187	250	130	1,740
46	60	209,000	1.00	264	2,180	6.0	188	50	9.500	50	68	100	925
60	141	605,500	1.98	332	3,300	9.0	385	89	158,400	412	550	211	1,625
54		44,282	1.12	206.	1840	5.0	25		9,260	370	497		1250
60		21,902	0.65	138.	1,083	3.0	20		1,560	78	96		670
41		13,381	0.39	108.	923	2.5	17		2,223	135	175		575
12		24,280	0.74	300.	1,020	2.8	20		1,349	68	90		662
17		20,093	1.05	122.	1,830	5.0	38		11,250	300	396		795
15		30,080	1.02	286.	2,560	7.0	16		2,640	162	222		1390
52		16,685	0.44	104.	830	2.3	16		4,129	258	347		653
1		20,267	0.59	193.	1,950	5.3	17		3,530	202	278		1117
34		18,950	0.60	311.	1770	4.9	16		4,030	250	338		1020
53		27,414	0.69	187.	1300	3.6	33		3,847	117	156		685
75		24,561	0.53	160	700	1.9	20		3,142	157	210		562
53		23,809	0.68	173.	1285	3.5	21.64		4,271	197	265		810
17		14,220	0.88	148	975	2.7							975
13		11,711	0.42	104	990	2.7	30		2,400	80	107		413
17		4,302	0.19	78	402	1.1							402
16		20,268	0.94	248	2050	5.6							2050
13		11,362	0.45	119	853	2.3	20		2,776	139	186		500
16		20,135	1.10	205	1450	4.0	15		3,027	200	270		921
1		12,499	0.64	202	1560	4.3	15		2,205	157	197		765
1		12,823	0.44	222	1430	3.9	2½		1,563	625	837		1320
5		12,108	0.70	201	2700	7.4	½*		385	770	1030		2600
2		12,511	0.51	236	2280	6.3	½*		95	190	254		2170
1		9,395	0.58	129	1170	3.1	16		781	56	66		505
4		7,164	0.34	122	635	1.6							635
1		7,204	0.32	103	627	1.7	20		120	6	8		277
9		11,977	0.55	160	1275	3.5	9.2		1027	112	227		800
14		3,034	0.30	78	690	1.9							690
4		5,843	0.71	124	846	2.3							846
9		7,142	0.80	158	1620	4.4	½*		168	338	450		1530
7		4,862	0.51	121	1080	3.0							1080
7		11,569	1.16	243	2490	6.7							2490
9		4,051	0.35	116	1840	5.1							1840
6		5,582	0.37	206	1010	2.8							1010
3		5,347	0.80	281	850	2.3							850
5		7,798	0.65	205	865	2.4							865
9		5,367	0.77	101	1580	4.3	⅓*		126	378	506		1480
52		6,060	0.61	155	1180	3.2	.083		29.4	354	474		1173

* Cancelling Machine Motor

drawn from the front without removing the water grate and brick fire stop arch. The brick set boiler is preferable to the portable type, the latter having a front flue connection necessitating interference

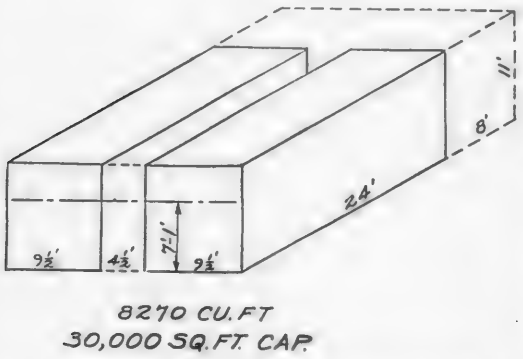


FIG. 5—ALTERNATIVE ARRANGEMENT FOR TWO STEEL BOILERS.

of the breeching with overhead steam piping. This is avoided in the brick set because of the rear flue connection.

Referring to Fig. 3, two cast-iron boilers are shown each having a capacity of 15,000 sq. ft. with an 8 ft. space between for the removal of sections and a 2 ft. space at the rear for the flue connection. Total cubic feet, 4,212. Water line, 5 ft. 8 in., as before.

For comparison of the above, two methods of installation for the steel boiler are shown as in Figs. 4 and 5. In Fig. 4, two boilers, each having a capacity of 15,000 sq. ft., are set in battery. A clear space of 4½ ft. at each side is required for the removal of the water grate bars with an 8 ft. space at the rear for the drawing of tubes. Total cubic feet, 9,330. Water line, 7 ft. 1 in.

In Fig. 5 two boilers having a total capacity of 30,000 sq. ft. are set with a space between them of 4½ ft. for the removal of the bars in the water grate. As before, an 8 ft. space at the rear is necessary for drawing tubes. Total cubic feet required, 8,270. Water line, 7 ft. 1 in.

The Establishment of a Standard for Transmission Losses From Buildings of all Constructions

By REGINALD PELHAM BOLTON.

(From report of the Educational Committee, presented before the National District Heating Association, Chicago, June 1-3, 1915.)

At first sight this subject appears to be, at the present time, somewhat elementary. Common practice has accepted results of certain experimental tests as determining the transmission of heat through building materials.

The pioneer work of Péclet in this direction has been followed by experiments conducted under the auspices of the German and French governments, and some individual work has been effected by other observers. The subject has long been presented in standard works such as those of Box and Carpenter, and in technical papers and pamphlets by Doctors Kinealy, Allen and Carpenter, by Messrs. Hubbard, Hogan, Wolff and Harding.

But, as Dr. James Hoffman says, "many of the values are only rough approximations at best." The various test results were compared by this author, who found quite a divergence between the references and prepared a table representing "a fair average" of all of them. These disagreements indicate that the matter is by no means conclusively decided. There are to begin with great variations in the character of the materials which are classed under a single description.

A "brick wall" may be of very variable materials in different localities, and "frame construction" may vary very largely in form as well as in workmanship.

But apart from these explainable divergencies, there is by no means a positive determination as to whether the rate of transmission is the same for a small difference as for a large difference of temperatures. This is a funda-

mental element which calls for definite determination. The rate of heat transmission should, theoretically, be in proportion to the difference of temperature between one surface and another, and this is the generally accepted assumption.

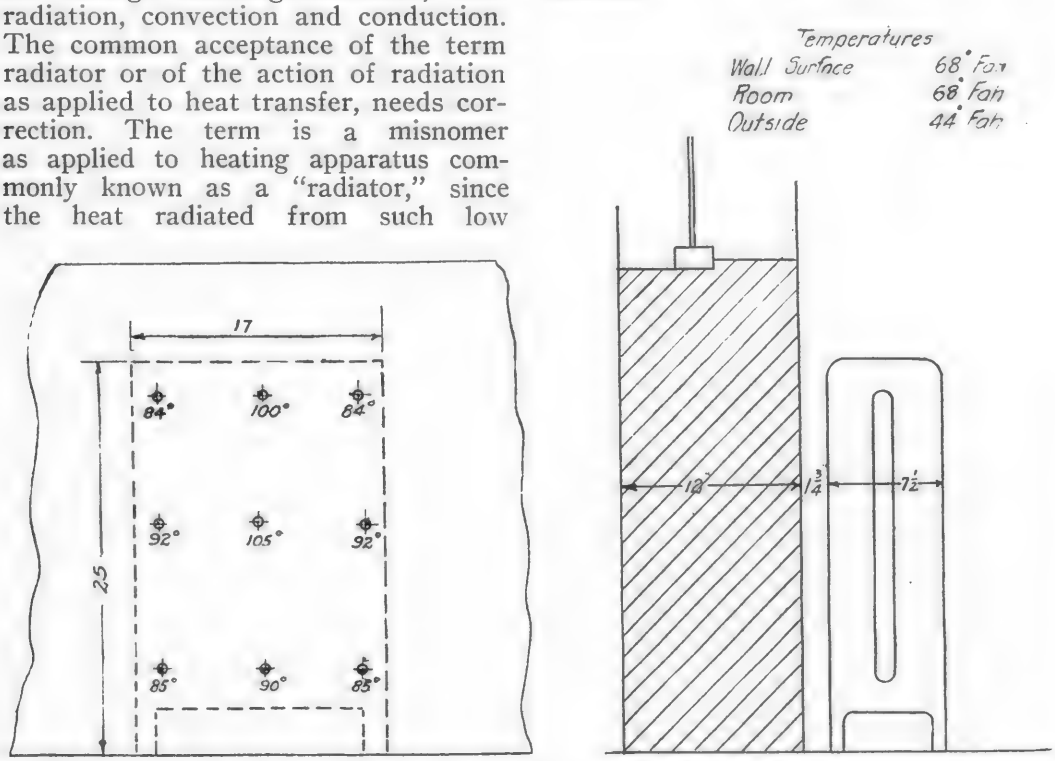
It may be nearly or wholly correct for materials of a homogeneous character, such as metal, but there is at least a probability that the rate may vary through composite materials, and through those offering a high extent of resistance to heat transfer.

In such materials it would seem possible that the rate of transfer would fall off materially at low differences between opposite sides of the material. If this is the case, it may account for some of the divergence between results observed in different experiments. This part of the subject is therefore still open to further investigation.

There are three forms of heat transfer through building materials, viz.: radiation, convection and conduction. The common acceptance of the term radiator or of the action of radiation as applied to heat transfer, needs correction. The term is a misnomer as applied to heating apparatus commonly known as a "radiator," since the heat radiated from such low temperature surfaces is a minor part of the work of heat transfer which they effect. They should be more properly termed "convectors," since by means of air-motion over their surfaces and physical transmission of heat by contact with it, they effect the major part of their work.

Available information upon the subject of radiated heat, its laws, its methods and its comparative effects, is extremely deficient.

We hardly know whether the transfer of energy which takes this form is really heat or is heat transformed to energy, which is retransformed to heat in the body or surface upon which it impinges or through which it passes. But whatever be its character or extent, such as it is, it is largely wasted in our present methods of installing heating apparatus. The modern method is to place "radiators" backing on an exterior wall, generally under a window.



The figures in area enclosed by dotted lines show temperatures in degrees Fahrenheit of the wall behind radiator

DIAGRAM ILLUSTRATING EFFECT OF PLACING RADIATORS CLOSE TO WALLS.

CONDUCTIVITY OF VARIOUS MATERIALS ENTERING INTO THE EXTERIOR CONSTRUCTION OF BUILDINGS, AS DETERMINED BY VARIOUS AUTHORITIES AND AUTHORS.

Materials		Heat units per degree difference per square foot							
Substance	Construction	Péclet (Carpenter)	German Government	Austrian Government (Macon)	Greene 1913	Recknagel and Reitschel	Carlton F. Tweed	Harding	Hoffman
Glass	single window	According to height (see note)	1.09	1.07	0.96	1.03	...	...	1.0
	single window (wet)		...	...	1.1	...	...	...	...
	single window (wire glass)		...	1.04	...	...	1.35	...	...
	double windows		...	0.418	0.47	0.41	.472	0.50	...	0.6
	single skylight		...	1.118	1.14	1.06	1.090	1.10	...	1.1
	double skylight		...	0.621	0.48	0.51	.492	0.60	...	0.7
Brick	wall, 8 in. thick		0.37	0.46	...	0.39	.37	0.39	...	0.4
	wall, 12 in. thick		0.32	0.32	...	0.31	.29	0.31	...	0.31
	wall, 16 in. thick		0.28	0.26	...	0.25	.25	0.25	...	0.26
	wall, 20 in. thick		0.25	0.23	...	0.21	.22	0.21	...	0.23
	wall, 24 in. thick		0.24	0.20	...	0.18	.19	0.18	...	0.21
	wall, 28 in. thick		0.22	0.174	...	0.16	.16	0.16	...	0.19
	wall, 32 in. thick		0.21	0.15	...	0.15	.14	0.15	...	0.17
Brick and Plaster	B. & P. 8½ in. thick		...	...	0.43	0.37	.36	...	0.5	...
	B. & P. 13 in. thick		...	...	0.43	0.29	.28	...	0.33	...
	B. & P. 17½ in. thick		...	...	0.29	0.24	.24	...	0.25	...
	B. & P. 22 in. thick		...	...	0.24	0.21	.21	...	0.21	...
	B. & P. 27½ in. thick		...	...	0.21	0.18	.18	...	0.17	...
Brick furred and plastered	B. F. & P. 8½ in. thick		...	...	...	0.24	...	0.24	0.41	0.28
	B. F. & P. 13 in. thick		...	...	...	0.20	...	0.20	0.3	0.217
	B. F. & P. 17½ in. thick		...	...	...	0.18	...	0.18	0.23	0.18
	B. F. & P. 22 in. thick		...	...	...	0.16	...	0.16	0.2	0.161
	B. F. & P. 26½ in. thick		...	...	...	0.14	...	0.14	0.16	0.147
Limestone	wall, 16 in thick		...	...	0.56	...	0.43	...	...	0.39
	wall, 20 in. thick		...	...	0.50	...	0.38	...	...	0.35
	wall, 24 in. thick		...	...	0.45	...	0.35	...	...	0.31
	wall, 28 in. thick		...	...	0.41	...	0.31	...	...	0.28
	wall, 32 in. thick		...	...	0.36	...	0.28	...	...	0.25
Sandstone	wall, 12 in. thick		...	...	0.58	...	0.45	0.28	...	...
	wall, 16 in. thick		...	...	0.51	...	0.39	...	...	...
	wall, 20 in. thick		...	...	0.45	...	0.35	...	...	...
	wall, 24 in. thick		...	...	0.41	...	0.31	0.23	...	...
	wall, 28 in. thick		...	...	0.37	...	0.28	...	...	...
	wall, 32 in. thick		...	...	0.31	...	0.26	0.19	...	...
Concrete	wall, 4 in. thick		...	...	...	...	...	...	1.07	...
	wall, 6 in. thick		...	...	...	...	...	...	0.7	...
	wall, 8 in. thick		...	...	0.49	...	...	...	0.53	...
	wall, 12 in. thick		...	...	0.43	0.48	...	...	0.36	...
	wall, 16 in. thick		...	...	0.37	...	...	...	0.26	...
Wood	clapboards		...	...	...	...	...	...	0.47	
	clapboards, paper lined		...	...	...	...	...	...	0.34	.3
	clapboards, sheathed		...	...	...	0.31	...	...	0.3	av'ge
	clapboards, sheathed and paper lined		...	...	...	...	...	...	0.26	
	ditto, and brick plastered		...	...	...	0.20	...	0.25	0.21	...
									Donnelly	...
	concrete, cinder fill, 4 in.		...	...	...	...	...	0.6	...	...
	concrete, cinder fill, 6 in.		...	...	...	...	...	0.5	0.43	...
	slated sheathed		...	...	0.43	...	...	0.43	0.36	...
	tin sheathed		...	...	...	...	...	...	0.31	...
	shingle sheathed		...	...	...	...	...	...	0.29	...
	tar and gravel		...	...	...	...	...	...	0.29	...
	mill tar and gravel		...	...	...	...	...	...	0.2	...
	shingle roof sheathed		...	...	...	0.31	...	...	...	...
Doors			...	0.414	...	0.34	...	0.31	...	...
			...	...	...	0.55	.410	0.48	...	...
	hardwood, ¾ in.		...	...	0.69	...	...	...	...	...
	hardwood, 1 in.		...	...	0.63	...	...	...	...	...

hardwood, 1½ in.....	0.53 ... ...
hardwood, 2 in.....	0.46 ... ...

Note—Péclet gives rates of heat transmis sion through glass, according to heights, as follows:

Window Height	Transmission in B. T. U. per sq. ft. per degree difference per hour
3 ft. 3 in	0.98
6 ft. 7 in	0.945
10 ft. 0 in	0.93
13 ft. 3 in	0.92
16 ft. 3 in	0.91

—Compiled by Reginald Pelham Bolton. April, 1915.

Whatever be the effect of radiation, one half of the heating element from which it is derived directs the rays to this wall, and not to the interior space required to be heated. The wasteful effect is increased by the action of convection, passing a column of warmed air between the "radiator" and the wall. The result is that the wall surface behind each radiator becomes heated to a temperature far in excess of that of the room or interior space and the transmission of heat through that part of the building construction or material is substantially accelerated.

Observations upon such an instance as that illustrated here, showed an average temperature of the wall surface of 90.7°, nearly doubling the difference between the mean exterior temperature and that part of the interior surface of the wall.

SUMMARY OF OBSERVATIONS UPON TEMPERATURES OF WALL SURFACES BEHIND RADIATORS.

Average seasonal difference — interior of room to exterior—70-44, 20° F.

Average temperature of wall behind radiator, 90.7° F.

Average temperature of wall surface of room, 68° F.

Heat transmission per hour through wall behind radiator at 0.33 B. T. U. per square foot per degree difference in temperature, 15.4 B. T. U. per square foot.

Heat transmission per hour through wall surface other than behind radiators (68-44) equal 24° difference at 0.33 B. T. U. per square foot per degree difference in temperature, 7.92 B. T. U. per square foot.

The rate of heat transmission per square foot through the walls behind radiators is approximately twice the rate through the other exposed wall surfaces of the room.

The second process of heat transfer is that with which the study of the transmission losses is chiefly concerned. The process of conduction is a flow of heat from one part to another physically communicated. It is probably accelerated, as the foregoing inquiry tends to show, by radiated energy passing into, and perhaps through the materials.

But the process of conduction in building materials evidently varies by several conditions of the structure affected. The solidity of the mass is one. A brick of a spongy character, having many air particles in its composition must resist the conduction of heat much more than one of semi-metallic nature, or of densely compressed material. So that "bricks" should be further defined, and we need to learn something more of the heat-conducting qualities of them and of other materials, such as woods, commonly used in buildings, before a standard can be set for the rate of heat conduction.

Perhaps, even more than the relative homogeneity of materials, their heat carrying capacity is affected by moisture. Water is a good conductor of heat compared to air, or to calcined substances, so that if a wall is water-soaked, its conductivity is thereby increased. Moreover, if its surfaces be wet, the transfer of heat from the surface to the air moving over the surface is bound to be accelerated.

It must not be forgotten that, in assuming a rate of heat transfer through building materials, the agent which imparts, and the agent which conveys away that heat may play a most important part. Hot moist air inside, with a damp wall surface should be an excellent agent to impart heat to a wall. So

also would be the effect in removal of heat of a wet wall and dry air outside.

Finally, the third element, convection, plays a large part in the rate of transmission of heat through wall and building surfaces. "Still air," inside or outside a building does not imply that even in the entire absence of wind movement, there is no movement of air upon the respective surfaces. Under such conditions an active motion is proceeding over both the surfaces, due to the acceleration of air movements by the dissipation of heat on the one side, resulting in a falling air current, and the reception of heat on the other, resulting in an upward air current.

The rate of these two motions must affect the rate of conduction of heat through the wall or other material. Such effects are well established in the process of heating water and in condensing steam. In such apparatus water is forced at high speed over heated surfaces greatly accelerating the heat transfer. We must suppose that very similar effects follow the action of quick air motion over building exteriors. But even with no wind, there is a lively upward motion of the enveloping layer of air around a building. The whole of the heat generated in a building has to find its way out through its surfaces, partly by leakage, but mainly by conduction. Every building, therefore, may be considered as a sort of "pyre," up the sides of which a column of heated vapor is whirling, rolling over on itself and joining a volume ascending from its windows and roof, which in still air ascends to some height before being fully absorbed into the aqueous atmosphere.

And it is not to be forgotten that each building may also be a large, though feeble, "radiator" directing low temperature rays of energy through surrounding spaces or into contiguous buildings.

From these considerations, it would seem that a vast amount of research, experiment and comparison remains to be done to decide the exact conditions of heat conduction through buildings, before the subject can be regarded as satisfactorily standardizable.

But as, in the meantime, and while this fascinating subject engages the further attention of the members of the heating profession, there must be some practical, approximate, or average data rendered available for our curent purposes; it may be of service to gather for our records and reference a compilation of the published results, which are, therefore, here presented for observation and use as judgment and experience may dictate.

Thoughtful consideration of some of the contingent elements to which attention has here been drawn will lead the student to apply to the use of these approximate determinations a cautious liberality by providing ample means of heating to cover possible deficiencies in the determinations of the rate of heat transfer through building materials.

Studies in Air Cleanliness

TESTS TO DETERMINE QUALITY OF CITY AIR WITH REGARD TO SUSPENDED IMPURITIES AND DISTRIBUTION OF IMPURITIES.

BY GEORGE C. WHIPPLE* AND MELVILLE C. WHIPPLE.

From a paper read at the annual meeting of the American Society of Heating and Ventilating Engineers, January 20-22, 1915.

Several series of experiments were made in Cambridge, Mass., during the past year for the purpose of studying the distribution of atmospheric dust in different districts of the city. The work was done at the instance of the Cambridge Sanitary Commission. The previous method of intermittent sampling of the air under different conditions was abandoned for one that registered the total precipitation of dust on a given surface over a period of several days. The advantage of the latter method is that it takes account of conditions dur-

* Professor of Sanitary Engineering Harvard University.

ing the twenty-four hours, and during any changes that occur from day to day. Any attempt to cover the same range by a count of dust particles in individual samples of air would involve an immense expenditure of time and effort.

METHOD OF COLLECTING DUST.

For collection of the dust two quart tin pails were used. These were coated with resistant varnish inside and out, about one liter of distilled water was placed in them, and they were suspended from the brackets on the poles of the Cambridge Electric Light Co. The height above the street varied from 20 to 21 ft. Later, when the varnish showed signs of cracking from exposure to air and water, glass jars were inserted in the pails to avoid any sources of error from the varnish or from corrosion of the pails.

The water served to retain any particles that settled out on its surface. About two weeks' exposure was allowed for each series of experiments and in this time evaporation did not exceed the liter of water originally placed in the pail. It averaged something less than 500 c.c. When the samples were brought into the laboratory the contents of the pails were carefully rinsed and each made up to one liter. Analyses were made of this water and the analyses when expressed in parts per million represented milligrams per liter, that is, total milligrams actually collected.

Various determination were made at the beginning of the work to obtain an idea of the amount of material collected, and it was found that the total solids obtained by evaporation of the water best represented this quantity, and it was considered that they supplied the most correct measure of suspended atmospheric impurities. Results for suspended solids in the water were not found to represent the suspended impurities on account of the solubility of portions of the atmospheric dust in the water in the pails. Filtration of the suspended solids showed effects of leaching, such as loss of color, and the filtrate was found to contain considerable traces of calcium, magnesium and chlorides.

Microscropical examinations were also made of a large number of samples but it was impossible to establish characteristic differences between them. The amount of agitation given the sample seriously affected the size of the particles which tended to agglomerate while in the pail. It was noticed by microscopical examination that the number of moulds increased greatly in the samples taken in the summer over those taken in the early spring.

Turbidity readings were taken on all samples and in the later work determinations were made of silica and iron.

SAMPLES DIVIDED INTO THREE SERIES.

For purposes of study all samples have been divided into three series, according to the particular time at which they were collected. Series I represents the period from April 2-14 inclusive, Series II, June 29-July 13, and Series III, July 31-August 14, 1914. All the arrangements for samples and analyses in connection with Series II and III were made by L. T. Fairhall of the Chemical Department at Harvard University.

In Table I is given a summary of weather conditions for the three periods. The first period was windy, the velocity reaching a high figure on two or three days. The winter's accumulation of street dirt was also being removed at this time. Series II and III were taken during normal summer weather, except for a considerable amount of rain during Series II.

TABLE I.—Amount of Rainfall and Wind Movement during Periods when Dust was Collected from the Air, Cambridge, Mass. (Compiled from Records of Boston Office of U. S. Weather Bureau).

Series Number	Date 1914	Rainfall in Inches	No. Days Rain fell	Total Miles Wind Movement	Maximum Wind Velocity, Miles per Hour
I	April 2-14	1.67	5	3469	47
II	June 29-July 13....	3.00	7	3091	25
III	July 31-August 14..	0.45	4	3195	22

The results of all total solids determinations have been arranged in order of magnitude and by series in Table II. The mean for each series is given, and also the calculated amount of solids in milligrams that would have fallen in one day upon a surface one square meter in area, and again in pounds per acre per day.

TABLE II.—Total Solids Collected at Different Times from Air in Cambridge, Mass.
Series I. April 2-14, 1914

Location of Sample	Total Solids in Milligrams	Total Solids Mg/Sq. Meter/Day	Total Solids Lbs./Acre/Day
Brattle St. and Sparks St..	184	1063	9.5
DeWolf St. and Cowperthwait St.	229	1322	11.8
Mt. Auburn St. and Hawthorne St.	252	1458	13.0
Garden St. and Concord Av	255	1472	13.1
Shepard St. and Garden St.	290	1680	14.9
Broadway and Dana St...	292	1690	15.0
Shepard St. and Walker St.	293	1696	15.1
Mass. Ave. and Waterhouse St.	303	1753	15.6
Brattle St. and Ash St.....	332	1920	17.1
Harvard St. and Dana St...	347	2005	17.8
Boylston St. at Power House	370	2141	19.0
Kirkland St. and Irving St.	374	2163	19.2
Cambridge St. and Kirkland St.	421	2430	21.6
Kirkland St. and Oxford St.	430	2483	22.0
Mass. Ave. and Arlington St	454	2622	23.2
Oxford St. at Pierce Hall..	497	2876	25.6
Putnam Ave. and Franklin St.	534	3085	27.4
Mass Ave. and Franklin St..	606	3510	31.2
Cambridge St. and Ellery St.	638	3690	32.8
Mass. Ave. East of Quincy Sq.	695	4020	35.8
Huron Ave. and Concord Ave.	951	5500	48.9
Mean	417	2409	21.4
Median	370	2141	19.0
Series II. June 29 to July 13, 1914			
Brattle St. and Feyerweather St.	102	506	4.5
Mt. Auburn St. and Maynard Pl.	125	621	5.5
Brattle St. and Ash St.....	126	625	5.6
Brattle St. and Craigie St.	142	705	6.3
Brattle St. and Fresh Pond Parkway	150	744	6.6
Elmwood Ave. and Fresh Pond Parkway	150	744	6.6
Cambridge St. and Maple Ave.	165	819	7.3
Hampshire St. and Elm St.	174	863	7.7
Hampshire St. and Plymouth St.	177	878	7.8
Hampshire St. and Amory St.	182	903	8.0
Hampshire St. and Tremont St.	299	1483	13.2
Mechanics Square	892	4425	39.4
Mean	224	1110	9.9
Median	158	782	7.0
Series III. July 31 to August 14, 1914			
Arlington St. and Washington Ave.	47	297	2.6
Linnaean St. and Raymond St.	56	354	3.1
Magazine St. and Erie St....	61	386	3.4
Brattle St. and Hawthorne St.	73	462	4.1
Holmes Pl and Peabody St.	76	481	4.3
Quincy St. opp. Colonial Club	78	493	4.4
Garden St. and Appian Way	82	518	4.6
Mt. Auburn St. and Elmwood Ave.	93	587	5.2
Beaver St. and Cowperthwait St.	95	600	5.3
Mt. Auburn St. and Aberdeen Ave.	97	613	5.4
Broadway and Ellsworth Ave.	98	619	5.5
Cambridge St. and Quincy St.	99	626	5.6
Mass. Ave. and Martin St..	141	892	7.9
Regent St. near R. R.....	186	1175	10.5
Western Ave. and Hews St..	196	1238	11.0
Hampshire St. and Elm St..	220	1390	12.4
Kendall Square	332	2098	18.7
Mass. Ave. North of M. I. T. Bldgs.	380	2400	21.4
Mechanics Square	414	2618	23.2
Mean	149	939	8.3
Median	97	613	5.4

The extremes in each series were widely separated in quantity. In Series I the maximum amount of solids collected was about five times that of the minimum amount, in Series II and III it is about nine times. An attempt was made to have the sampling stations scattered in all classes of districts throughout the city from the residential to the manufacturing sections. Series I had no samples in purely industrial districts. It represented residence and business districts, and included local ways and main thoroughfares. A more general representation was included in Series II and III. The locations at which the smallest amount of solids was collected were in the residence districts in each set of experiments, while the largest amounts were collected near the industrial centers or in portions of the city where conditions favored dust formation. The effect of an industrial center with large factories and poor streets upon the atmosphere of the surrounding district is shown in Series II and III. The highest figures for total solids were obtained at Mechanics Square. This is the center of a very poor district of the city in which there are numerous factories and plants, and streets in poor condition. The exceptionally high figure in the second series might easily have been due to a cleansing of the air from small particles of dust and soot during the rainfall of that period. There were two or three hard showers.

USE OF SPOT MAP TO SHOW DISTRIBUTION OF DUST.

Of interest in connection with the distribution of dust over the city was a spot map prepared from the results of these experiments. A median figure was taken for each set of experiments. Upon a large map of the city pins were placed at the location of each station, the pin being green if the amount of dust collected at that station was less than the median figure, and red if it was more than the median. A survey of all the streets in the city had been made during

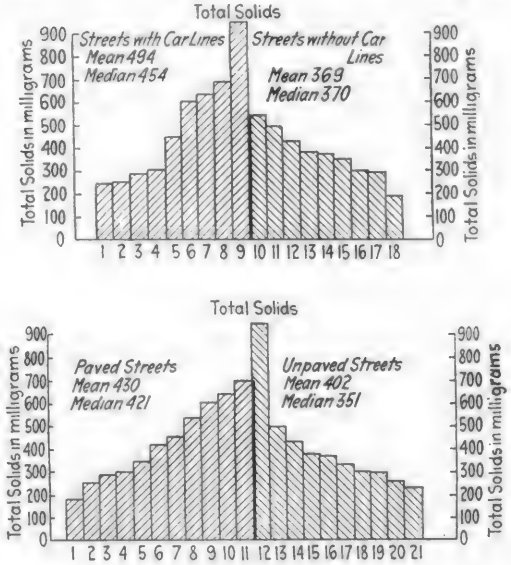
the period of dust collection and a rating of good, fair, bad and indifferent given to them in accordance with their state of repair and cleanliness. Upon the map the rating was indicated by coloring the street, or portion of it blue, green, red or yellow respectively to conform with the rating given. After all the pins had been placed it was observed that practically all the green pins were in the blue or green street areas, and the red pins in the red of yellow areas. In other words, the low dust figures were obtained on streets where the roadway was in good condition, well oiled, or clean, and the high dust figures on streets that were rated as in poor condition or dirty.

HIGH DUST DISTRIBUTION ON STREETS HAVING STREET CAR LINES.

The exception to this distribution was in the case of the main thoroughfares that were rated in good condition and that had street care lines upon them. Red pins, representing high figures for dust were found upon several of these. Massachusetts Avenue, the main artery of the city, had figures above the median throughout its length as did Cambridge Street. Mt. Auburn Street, another through street with a car line and good pavement had low figures for dust. This was explained by the fact that Mt. Auburn Street borders a parkway along the Charles River, and has very few buildings on that side of the street and almost no cross traffic along the portion of it where sampling stations were located.

Comparison of the results obtained in each of the three series of experiments shows that considerably more dust was collected for the period between April 2 and 14 than for the other two. The mean of all the results for this period showed that solids were collected at the rate of 2,409 milligrams per square meter per day; for the period between June 24 and July 13 the amount was 1,110 milligrams; and between July 31 and August 14, 939 milligrams. The differences are consistent with the conditions prevailing during each series. In the first a large proportion of the winter's accumulation of dirt laid on the streets or was in process of removal. The total wind movement on each of three days was in excess of 300 miles and on April 12 reached a velocity of 47 miles per hour. None of the streets had been oiled at this time, a factor which no doubt exerted considerable influence as there is a very large mileage of streets in Cambridge that have dirt or macadam surfaces.

The wind movement during the second and third series was about the same for each, but on three days of the second series there was rainfall in excess of 0.6 in. These showers were five days apart with very little precipitation on the days between them. Inasmuch as heavy rains have a cleansing effect on the air it is



QUANTITIES OF DUST COLLECTED 20 FT. ABOVE VARIOUS STREETS, APRIL 2-14, 1914.

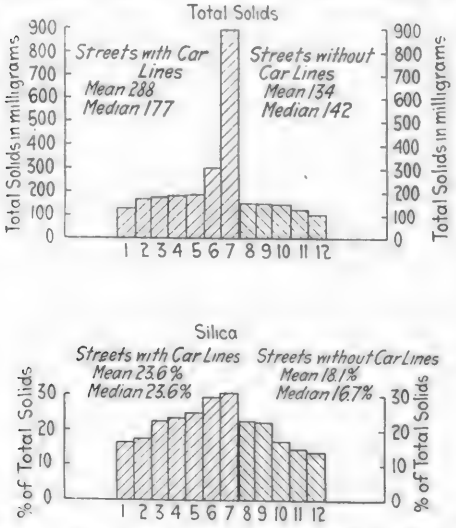
probable that considerable amounts of fine particles were precipitated by these showers.

DESCRIPTION OF DIAGRAMS.

In Diagrams 1, 2 and 3 the determinations of each series have been arranged in order of magnitude and divided into two groups, according to whether the sample was taken on a street with a car line or without. In Diagram I a division is also made on the basis of paved and unpaved streets. The heavy center line at the intersection of the cross-hatching divides the two groups in each case. On account of the undue weight given to certain extreme results in computing the mean or average results the median fig-

ure as well as the mean has been indicated on the diagrams.

It will be noticed that in each diagram under the head of total solids both the mean and median figures are higher for those samples collected on streets with car lines than for those collected on

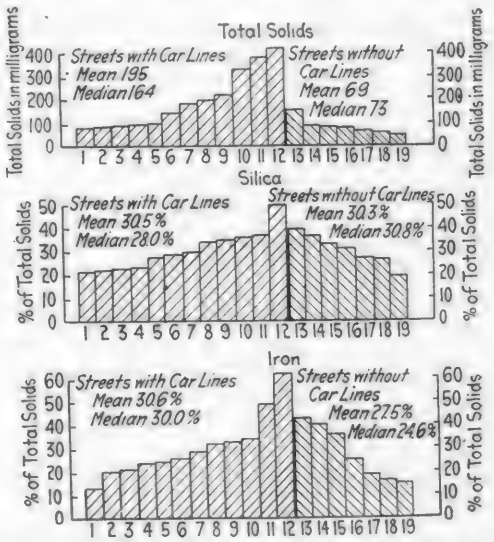


TOTAL SOLIDS AND PERCENTAGES OF SILICA IN SAMPLES OF DUST COLLECTED 20 FT. ABOVE VARIOUS STREETS, JUNE 29 TO JULY 13, 1914.

streets with no car lines. This is not on account of the poor condition of the pavements on car line streets, for with only one exception the survey showed the surface of such streets to be in a good state of repair and throughout the greater part of their length these streets were covered with a smooth surfaced material, such as asphalt, bitulithic or wood block pavement. The controlling factor in such cases is the rapid motion of car traffic over the streets. Unless the pavement between and close to the rails is kept clean a cloud of dust is raised with the passage of each car. The height and extent to which this cloud is scattered can be seen very well at night near street lights where a dark ground illumination occurs. The material scattered about consists of organic debris, gritty siliceous material and metallic dust from rails, wheels and brake shoes. All streets over which surface cars are operated should receive special attention from the street cleaning department.

Diagram I. also shows the relative amounts of dust deposited over paved and unpaved streets. At the period when the samples were taken the unpaved streets were in their worst condition, as they had not yet been oiled. Inasmuch as the paved streets showed larger amounts of dust than the unpaved it is assumed that the effect of car traffic is reflected again in this diagram. Nearly all the paved streets had car lines running over them.

Full knowledge of the significance of dust in the atmosphere and its effects upon the health of the individual is not possessed by scientists at the present time. So far as these things have been studied, principally in connection with dusty trades, the opinion has been formed that the most dangerous dust particles are those of a gritty, rough na-



TOTAL SOLIDS AND PERCENTAGES OF SILICA AND IRON IN SAMPLES OF DUST COLLECTED 20 FT. ABOVE VARIOUS STREETS FROM JULY 31 TO AUGUST 14, 1914.

ture. There is a large amount of such material in street dust.

As the studies outlined in this paper progressed the idea was suggested that a determination of the siliceous material and iron in the solids collected might be of interest. Accordingly, analyses of silica and iron were made on some of the samples. The results are presented graphically in Diagrams 2 and 3 where the amounts of these substances are shown in percentages of the total solids collected.

The percentage differences are not great, but in each case the average results are somewhat higher for paved streets. The figures do not necessarily imply that the same percentages of silica and iron existed in the street dust as in the dust of the air. It was undoubtedly higher in the former, for silica and iron have a higher specific gravity than organic matter and would tend to settle out of the air more quickly than the latter. As already stated the samples were collected 20 ft. above the street.

The survey of atmospheric conditions in cities is a field of investigation that is rather new to sanitary science, but one that will be thought of seriously as our interest in such matters is quickened by an increasing knowledge of subjects that relate to the air we breathe. It is the opinion of the authors that the studies in Cambridge, as outlined in this paper, suggest a method of undertaking such surveys, which with refinements and adjustment to particular conditions will prove valuable in the information it furnishes. By its use an idea may be gained of the total amount and character of the solids precipitated from the air in a given period of days, the distribution of these suspended impurities geographically, and the extent to which their quantity is affected by varying weather conditions. Interpretation of the results, in connection with a thorough knowledge of the streets, life and industries in the districts investigated, will generally suggest specific remedies for the improvement of these districts.

The above investigation was made in the Laboratory of Sanitary Engineering of Harvard University and was made possible by funds kindly furnished by Ernest C. Dane of Brookline.

Heating Data for Varying Conditions

Heating data for other than the usual conditions form an important part of the report submitted by the Education Comittee at the recent meeting of the National District Heating Association. This portion of the report was contributed by James A Donnelly, of New York.

TRANSMISSION FROM RADIATING SURFACES.

Under "Transmission from Radiating Surfaces," the following table is presented showing the relative surface in pipe coils and wall radiators:

Mr. Donnelly then refers to the lower

RELATIVE SURFACE IN PIPE COILS AND WALL RADIATORS.

COILS TEN FEET LONG								WALL RADIATORS			
1 in. Pipe		1¼ in. Pipe		1½ in. Pipe		2 in Pipe					
No. of Pipes	Square Feet	No. of Pipes	Square Feet	No. of Pipes	Square Feet	No. of Pipes	Square Feet	No. of Sec's	Sq. Feet Surface each sec.		Total Surface Sq. Ft.
3	10	—	—	2	10	—	—	2	5		10
4	13⅓	3	13	—	—	2	12½	2	6		12
5	16⅔	—	—	3	15	—	—	3	5		15
—	—	4	17⅓	—	—	3	19	3	6		18
6	20	5	21⅔	4	20	—	—	3	7		21
7	23⅓	—	—	5	25	4	25	4	6		24
8	26⅔	6	26	—	—	—	—	3	9		27
9	30	7	30⅓	6	30	5	31	5	6	on end	30
10	33⅓	8	34⅔	7	35	—	—	5	7	on end	35
11	36⅔	9	39	—	—	6	37½	4	9	on end	36
12	40	10	43	8	40	—	—	6	7	on end	42
14	46⅔	—	—	9	45	7	44	5	9	on end	45
15	50	11	47⅔	10	50	8	50	7	7	on end	49
16	53⅓	12	52	11	55	9	56	6	9	on end	54
18	60	14	60⅔	12	60	10	62½	7	9	on end	63
22	73⅓	17	74	14	70	12	75	8	9	on end	72

pressures now carried on steam heating plants through the introduction of vacuum return line and vapor systems and figures that the radiators are often operated at a temperature of not over 210° F. This temperature of the steam is, therefore, taken as a standard condition and is used in compiling the following table of the transmission of heat in B.T.U. per square foot per hour, under the standard conditions of 70° room temperature:

TRANSMISSION OF HEAT IN B.T.U. PER SQUARE FOOT PER HOUR FOR 70° F. ROOM TEMPERATURE.

Cast iron direct radiators.

	45 in.	38 in.	32 in.	26 in.	22 in.
1 column...	262	270	275	279	285
2 column...	241	250	257	263	270
3 column...	222	231	240	248	255
4 column...	210	218	225	233	240

Wrought pipe coils 1 in. to 2 in.dia..	300
Cast iron wall radiators, on side...	290
Cast iron wall radiators, on end....	280

COMPARATIVE RADIATOR TRANSMISSION AT VARIOUS TEMPERATURES.

Mr. Donnelly then quotes the point as brought by C. A. Fuller in THE HEATING AND VENTILATING MAGAZINE for March, 1915, that the rate of heat transmission from a direct radiator does not vary directly as the difference in temperature between the radiator and the room. The coefficient per degree difference is found to vary approximately 2% for each 10 degrees variation from standard conditions. Based on this variation, the following table is included in the report, showing the comparative transmission at different temperatures:

In order to find the temperature of a radiator for any desired transmission, the above process may be reversed by the application of the following formula:

Temperature of radiator $= \sqrt{280T + 32{,}400} - 110$. In which T equals transmission in B. T. U. per square foot per hour.

Example: If the tranmission of a radiator is 250 B. T. U. under standard conditions of room 70°, radiator 210°, what will be the temperature of the radiator for a transmission of 125 B. T. U. per square foot per hour?

Solution: 280 x 125 equals 35,000 which added to 32,400 equals 67,400. Extracting the square root gives 259.6. Subtracting 110 leaves 149.6, which is the required temperature of the radiator.

The following table gives the proportionate heat losses from buildings, with varying outside minimum temperatures, and with a room temperature of 70°. Also the proportionate amount of radiation to heat the room to 70° with steam at the ratdiator at 210°.

PROPORTIONATE HEAT LOSSES WITH VARYING OUTSIDE MINIMUM TEMPERATURES.

Outside min. tem. Deg. F	Inside or room tem. Deg. F	Proportionate heat loss	Proportionate radiation required
35	70	0.50	0.50
30	70	0.57	0.57
25	70	0.64	0.64
20	70	0.71	0.71
15	70	0.79	0.79
10	70	0.86	0.86
5	70	0.93	0.93

COMPARATIVE RADIATOR TRANSMISSION AT DIFFERENT TEMPERATURES.

Steam temp. Deg. F.	Room temp. Deg. F.	Diff. temp. Deg. F.		Stand. co-eff.			B. T. U. per sq.ft. per hr.	Propor. trans. co-eff.
260	70	190	x	1.785	plus	10%	373	1.49
250	70	180	x	1.785	plus	8%	347	1.39
240	70	170	x	1.785	plus	6%	322	1.29
230	70	160	x	1.785	plus	4%	297	1.19
220	70	150	x	1.785	plus	2%	273	1.09
210	70	140	x	1.785	Standard		250	Condition. 1.00
200	70	130	x	1.785	minus	2%	227	0.91
190	70	120	x	1.785	minus	4%	206	0.82
180	70	110	x	1.785	minus	6%	185	0.74
170	70	100	x	1.785	minus	8%	164	0.66
160	70	90	x	1.785	minus	10%	145	0.58

Zero	Standard	70	1.00	Conditions	1.00
— 5		70	1.07		1.07
—10		70	1.14		1.14
—15		70	1.21		1.21
—20		70	1.29		1.29

The proportionate surface required to heat a room to 70° under the above standard conditions for the radiator is the same as the proportionate heat loss for any outside minimum temperature.

The following tables gives the proportionate heat losses from buildings, the proportionate transmission from direct radiators, and the proportionate radiation required (*with steam at* 210°) for various room temperatures, when *the outside temperature is zero.*

PROPORTIONATE HEAT LOSSES FROM BUILDINGS			PROPORTIONATE TRANSMISSION OF DIRECT RADIATORS			PROPORTIONATE SURFACE REQUIRED FOR HEATING	
Room temp. Deg. F.	Proportionate loss in B. T. U.		Diff. in temp. Between rad. and room. Deg. F.	Proportionate transmission in B. T. U.		Room temp. Deg. F.	Proportionate surface req., sq. ft.
35	0.50		175	1.34		35	0.37
40	0.57		170	1.29		40	0.44
45	0.64		165	1.24		45	0.52
50	0.71		160	1.19		50	0.60
55	0.79		155	1.14		55	0.69
60	0.86		150	1.09		60	0.78
65	0.93		145	1.05		65	0.89
70	1.00	Standard	140	1.00	Conditions	70	1.00
75	1.07		135	0.95		75	1.12
80	1.14		130	0.91		80	1.26
85	1.21		125	0.87		85	1.40
90	1.29		120	0.82		90	1.56
95	1.36		115	0.78		95	1.74
100	1.43		110	0.74		100	1.93
105	1.50		105	0.70		105	2.15
110	1.57		100	0.66		110	2.39
115	1.64		95	0.62		115	2.66
120	1.71		90	0.58		120	2.95

Assuming that the rate of heat loss from a building varies directly with the difference between the outside temperature and the building temperature, and considering the heat loss for zero outside 70° inside as the standard, or 100 per cent.; the second column shows the proportional loss of heat from a building when the outside temperature is zero, and the inside temperature is as given in the first column.

Assuming that the rate of transmission from a direct radiator to the air of a building is in proportion to their difference in temperature, with a variation in the rate of transmission of 2 per cent., greater or less, for each 10° increase or decrease in their temperature difference, and considering 140° difference in temperature (steam 210° building 70°) as standard, or 100 per cent. transmission, the fourth column shows the proportionate transmission when the difference in temperature is as given in the third column.

Assuming that under standard conditions of outside temperature zero, building temperature 70°, and radiator temperature 210° (or 140° difference between the radiator and room) the amount of radiation necessary is 100 per cent., the proportionate amounts of radiation given in the sixth column are those necessary to heat a building to the temperatures given in the fifth column, when the outside temperature is zero.

NOTE. The amount of surface required for heating is always obtained by dividing the heat loss from the building by the amount of heat transmitted per square foot of radiation. Therefore, as may be seen from the above tables, the proportionate amount of surface required for heating is obtained by dividing the proportionate heat loss from the building by the proportionate transmission of the radiator, in each case.

The foregoing table may be used to find the proportionate amount of radiation necessary to heat a room to any desired inside temperature, other than 70° F.,

when the outside minimum temperature is other than zero. Find the difference between the ouside temperature and the room temperature in the first column; divide the proportionate heat loss opposite this amount, in the second column, by the proportionate transmission opposite the difference in temperature between the radiator and the room, as given in the fourth column, and the result will be the proportionate amount of radiation required.

EXAMPLE: What is the proportionate amount of radiation required to heat a room to 90° F., with a temperature of 20° F. below zero outside?

SOLUTION: The difference in temperature between 20° outside, and 90° F. inside, is 110°. Opposite 110 the protionate heat loss, or 1.57, is found in the second column. The difference in temperature between the radiator and the room (steam 210°, room 90°) is 120°. Opposite this the proportionate transmission, 0.82 is found in the fourth column. Divide 1.57 by 0.82 and the quotient, 1.91, is the proportionate amount of radiation required.

Comparison of Operating Conditions.

Gravity hot water systems using an open tank are usually figured for a maximum temperature of about 180° F. at the boiler, with a drop of 20° through the system, thus having 160° in the return at the boiler, or an average temperature at the radiators of 170°. Pressure water systems, using ordinary safety valves or mercury seals, as well as forced circulation systems (those using circulating pumps) are often figured as high as 220° to 230°, thus frequently maintaining an average for the radiators of 210° in zero weather.

Some attempts have been made to operate an entire heating plant under a steam pressure below that of the atmosphere in mild weather, varying the temperature of the radiator by the vacuum carried, in proper relation to the outside tempeature so that, with the entire radiator heated, its temperature would be at the proper point for maintaining the room temperature at 70°. In this case the various radiator temperatures would be the same as for a forced circulation hot water system, provided the radiator temperature for zero weather was the same (210°) for each system.

The following table gives the required temperature of the radiator for various outside temperatures for a forced water circulation or a vacuum steam system; the pressure of steam or the degree of vacuum which must be carried to maintain this temperature with the steam system and the B.T.U. transmission by a standard cast iron radiator under this temperature. Also the required temperature of the radiator and the transmission for a gravity circulation water system.

REQUIRED RADIATOR TEMPERATURE FOR VARIOUS OUTSIDE TEMPERATURES.

Outside temp. Deg. F.	—FORCED WATER OR VACUUM STEAM— Temp. of rad. Deg. F.	Pressure or vacuum of	B.T.U. per sq. ft.	—GRAVITY WATER— Temp. of rad. Deg. F.	B. T. U. per sq. ft.	Perc't rad. fractional system.
—20	240	10.25 lbs.	322	192	211	1.29
—15	233	7.25 lbs.	304	187	199	1.21
—10	225	4.25 lbs.	286	181	187	1.14
— 5	218	2. lbs.	268	176	176	1.07
Zero	210	1. vac.	250	170	164	1.00
5	202	5.5 vac.	232	162	149	.93
10	194	9.0 vac.	214	157	138	.86
15	186	12.5 vac.	196	150	126	.79
20	177	15.5 vac.	179	144	115	.71
25	168	18.0 vac.	161	137	103	.64
30	159	20.5 vac.	143	131	92	.57
35	150	22.5 vac.	125	124	80	.50
40	140	24.0 vac.	107	118	69	.43
45	130	25.0 vac.	89	110	57	.36
50	119	26.5 vac.	71	103	46	.29
55	108	27.5 vac.	54	95	34	.21
60	96	28.3 vac.	36	87	23	.14
65	83	28.8 vac.	18	79	11	.07

In the last column the proportional amount of the radiator which is to be heated for various outside weather conditions is given for a fractional air-return vacuum or vapor system.

It will be noted that the degree of vacuum which it is necessary to carry in order to properly heat a building increases very rapidly for a comparatively slight rise in the outside temperature. This makes it practically impossible to carry a sufficiently low pressure and temperature to prevent overheating by this method alone. It is very difficult to maintain vacuums of even 15 to 20 in., and almost impossible to maintain one higher than this. It has, therefore, come to be considered much better practice to control the heating effect of a radiator by heating a portion of it by means of a fractional system, rather than attempt to heat all of the radiator, but to reduce its temperature in relation to the outside temperature by carrying a varying vacuum within it.

It will be seen from an examination of the column of radiator temperatures for a gravity water circulation, that where a system is designed for 170° water at the radiator in zero weather, if the heater is large enough to maintain the water at 192°, the radiation would then be sufficient to keep the building at 70° when the outside temperature was 20° below zero.

In the same way it may be noted that where a fractional vapor or vacuum system is designed for substantially atmospheric pressure in zero weather, if the boiler is large enough and the system is of such a type that it may be run at 10 lbs. steam pressure, the radiation, being 29% below zero.

DATA FOR DESIGNING SYSTEM, BASED ON ORDINARY CONDITION.

In a moderate climate, where the temperature seldom drops below 10°, it is quite safe to design a steam system for atmospheric pressure at about 16° above zero outside temperature. This would make about 10 lbs. steam pressure necessary if the minimum of zero outside was ever reached. The standard hot water temperature may be shifted in the same manner. The result of these changes is shown at bottom of page.

The steam boiler or hot water heater should not, however, be reduced in size when the amount of radiation is reduced in this manner. The size of the boiler should be proportioned from the B.T.U. losses of the building from the minimum outside temperature to 70° inside.

The following table gives the proportionate radiation required to heat a building from zero outside to 70° inside, with varying maximum temperatures of the radiators. Also the proportionate size of the boiler or heater for the corresponding maximum temperatures of the radiators.

Temp. of radiator Deg. F.	Transmission B. T. U.	Pro. surface required sq. ft.	Pro. boiler load steam	Pro. load hot water
240	322	.78	1.29	—
230	297	.84	1.19	—
220	273	.92	1.09	—
210	250	1.00	1.00	1.52
200	227	1.10	—	1.38
190	206	1.21	—	1.26

FORCED WATER OR VACUUM STEAM				GRAVITY WATER	
Outside temp. Deg. F.	Temp. of rad. Deg. F.	Pressure or vacuum of	B. T. U. per sq. ft	Temp. of rad. Deg. F.	B. T. U. per sq. ft.
Zero	240	10.25 lbs.	322	192	211
5	231	6.5 lbs.	299	185	196
10	221	3.0 lbs.	276	178	181
15	211	1.0 vac.	253	171	166
20	201	5.5 vac.	230	163	151
25	191	10.0 vac.	207	155	136
30	180	14.0 vac.	185	147	121
35	168	18.0 vac.	161	139	105.5
40	156	21.0 vac.	138	130	90
45	144	23.0 vac.	115	121	75
50	131	24.5 vac.	92	112	60
55	117	26.0 vac.	69	102	45
60	103	28.0 vac.	46	92	30
65	87	28.5 vac.	23	81	15

180	185	1.35	—	1.13
170	164	1.52	—	1.00
160	145	1.72	—	.88
150	126	1.99	—	.77

Organization of Building Data League.

One of the most unique organizations of its kind is the recently-organized Building Data League, Inc., an outgrowth of the Architects' Bureau of Technical Service. Its membership is made up of consumers, organized to secure through co-operation exact and reliable information as to the quality and relative economic values of the vast number of materials and devices used in the construction and equipment of buildings. The league's purpose is to establish market standards in the building industry, so that the consumer may readily secure accurate information and a working knowledge of available materials, methods and devices. On the other hand, the league will direct the attention of the producer to the demands of the consuming class with a view of securing high standards and methods in the manufacturing and marketing of products. The league is a New York corporation, with headquarters at 105 West 40th Street, New York.

One of the important functions of the league is to conduct investigations and examinations, where necessary, of given products and to give them a market rating. As a rule, however, the league will accept such standards of quality as are established by recognized authorities.

The investigations mentioned and the establishment of standards will be in the hands of technical committees appointed by the league. In this connection the league will prepare for the use of its members standard specifications which will accurately define quality, making distinctions between the several established grades. The idea is to supplement the work being done by the United States Bureau of Standards, the American Society for Testing Materials and similar bodies.

The league's investigations will comprise the following important considerations from which ratings are to be determined:

1. Performance of the product under service test.

2. Production, including raw materials, shop practice, plant efficiency, capacity, organization and deliveries.

3. Market, including demand, adaptability, cost, difficulty incident to installation and service efficiency.

4. Sales, including character and reliability of advertising matter and claims, selling tactics, the producer's attitude toward the market, organization and financial responsibility.

The producer is expected to meet the expense of the investigation. The league also plans to publish a monthly bulletin and ultimately to establish technical libraries for the use of its members.

Among the technical committees for the first year are those on mechanical devices and equipment, sanitary equipment, insulation, building codes and structural methods. Upon the assumption that the members of the league will not be able or willing to devote the time and labor necessary for the conduct of adequate investigations and for the preparation of standard specifications and reports, an agreement is made with the Building Data Co., Inc., an organization formed especially for the purpose of rendering technical service to the league.

Membership in the Building Data League is open to any individual or any person as a representative of a firm, corporation, or association, which is a non-producer of materials, devices, methods or apparatus entering into the construction or equipment of buildings, or the improvement of real property. The dues are placed at $9.00 and the subscription to the league's bulletin at $1.00. There is no initiation fee.

In the present organization of the league the chairman is Lansing C. Holden, F. A. I. A.; first vice-chairman, Charles L. Borie, Jr., A. I. A.; second vice-chairman, James S. Macgregor; secretary, Sullivan W. Jones, A. I. A., and treasurer, Frank Sutton, M. Am. Soc. M.E.

The affairs of the league are managed by a board of twenty-five governors, made up of engineers and architects

International Engineering Congress.

A general programme has been published of the International Engineering Congress of 1915 and the Engineering Society conventions, which will be held at San Francisco, Cal., from September 16 to September 25. The programme covers in outline the conventions of the four national societies supporting the International Engineering Congress, the meetings of the congress, and the excursions which have been planned to various points of engineer interest. A map is included containing a key to the excursions.

William Gordon Corporation, of New York.

A new firm of heating engineers and contractors has recently been organized by William Gordon, formerly chief mechanical engineer for the Thompson-Starrett Co., New York. It is known as the William Gordon Corporation, with headquarters at 107-109 West 23rd Street, New York.

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THE WRITER of "Cows May Come and Cows May Go, But the Bull Goes on Forever" may not have been thinking of manufacturers' catalogues. But we suspect he had some of them in mind. The average manufacturer has never been distinguished for his modesty in his printed matter, although it is a noteworthy sign of the times to see a more careful regard for accurate statements in the more important engineering catalogues. One of the trials of the editor in describing new products very often is literally to tone down the claims made with the utmost confidence, but it may be, without a shred of engineering proof.

In the general merchandise field a movement has been successfully carried on through some of the magazines and newspapers to test the various articles offered to the public and to give in the printed advertisements some mark to indicate proved quality. Of course, such stamps of approval depend for their value upon the integrity of the examiners, but so far there has been every inducement to conduct the tests and report the results with absolute faithfulness.

There has now been inaugurated a movement upon somewhat similar lines in the building field. In this case, the investigations and tests are to be conducted under the supervision of a body of architects, chemists and engineers. It is proposed by this means to establish market standards in the building industry, so that the consumer may readily secure accurate information and a working knowledge of available materials, methods and devices. In other words, it is proposed to give various building materials and apparatus a market rating.

Such a service, if faithfully carried out, will no doubt be of great value to the man who writes the specifications and is really so important a movement as to raise honest doubts of its feasibility. We have in mind now the testing and rating of the more elaborate mechanical apparatus where the results may be affected to a degree through faulty technique. Here again not only is the element of integrity involved, but accuracy as well. However, it is possible to thoroughly and accurately test every appliance on the market and to make the results of such tests available to those interested. Such an achievement has long been dreamt of, and it must be admitted that the lines on which the idea is now being planned give considerable promise of success.

AS USUAL during the summer months, the weather charts for five representative American cities will be omitted. Their publication will be resumed in the Fall.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Twenty-Seventh Annual Convention, Milwaukee, Wis., June 21-24, 1915

A typical Western meeting, in which the representation was largely from the Middle West, was the way most of the delegates characterized the twenty-seventh annual convention of the National Association of Master Steam and Hot Water Fitters, held in Milwaukee, Wis., June 21-24, 1915.

While some important business was transacted, notably in connection with a change in the scope of the association's "Trade Resolutions," the most significant feature of the meeting was the lavish hospitality of members and friends of the association in Milwaukee, the convention city. The Milwaukee committee fairly outdid itself in connection with the entertainment programme and achieved a record that it will be difficult for future committees to equal. Moreover, the various details of the programme had been arranged with evident care and were carried out with scarcely a hitch, greatly adding to the pleasure of the occasion.

JOHN T. BRADLEY, ST. LOUIS.
Re-elected Prsident of the National Association of Master Steam and Hot Water Fitters.

At the opening session the convention was welcomed by Mayor G. A. Bading of Milwaukee. The mayor was followed by Judge John C. Karel of Milwaukee, whose eloquence was marked as he seconded the mayor's welcome. President John T. Bradley responded to the addresses of welcome and then presented his address.

PRESIDENT'S ADDRESS.

President Bradley, after expressing his pleasure in meeting again with his friends and fellow-workers in the craft, traced the development of the association and its accomplishments since its beginning in 1889.

He stated that the present enrollment is approximately 900.

"Evolution," he continued, "is going on in our affairs, as well as in the affairs of others. We are solidifying in our common interests. We are getting closer together every day. We are more closely united in the bonds of fellowship. We are dropping former suspicions and prejudices so that when we meet it is with the friendly greeting of confidence. We meet as men of honor and respect each other. We respect and obey the decisions of our officers; in them we have every confidence and to them we confide the care and management of our affairs for the year.

"Those who have been in touch with the work for so long a period appreciate fully the change that has taken place. At the time the founding of the national association was suggested, every master fitter was from a business standpoint the

enemy of every other master fitter, with the result that frequently the owner and architect took advantage of him. Many of the master fitters at that time had little business experience and in many cases comparatively little knowledge of the engineering side of their business. The result was that they entered into contracts containing guarantees that were impossible of fulfillment and the road was strewn with the wrecks of the concerns who attempted to do the impossible."

At another point in his address President Bradley said:

"The national association does not aim to formulate or enforce its suggestions by any mandatory process. It does not attempt to overturn, by radical measures, the customs of the steam-fitting business unless such customs are clearly wrong. Nor does it anticipate speedy reforms from its efforts because it does not attempt to dictate to or control the local and State associations which form part of it. It is, however, an organization for the purpose of acting unitedly on problems which are of common concern in the belief that in such united action lies the greatest safety. The national association has no other purpose or object than to act for the best interests of all."

In referring to the work of standardization done by the association, President Bradley said:

"A form of valuable work done by the national association is in line of standardization. Every master steam fitter who was in business twenty-five years ago knows, and probably experienced, the troubles incident to the various sizes, dimensions, weights, ratings, etc., adopted by different manufacturers (each according to his own notion) of articles entering into our work.

"In those days if you had to change an ordinary flange it required the most minute instructions in order to secure one that would replace the one removed. The national association took this matter up and, after much consideration, a 'Standard Schedule for Flanges' was adopted in 1894.

"Some manufacturers kicked vigorously, claiming it meant expense to them to alter patterns, etc. This was true, but, after all, who paid the bill? The object sought was accomplished by the master steam fitters specifying flanges in accord with the standard flange schedule, and finally all the manufacturers complied.

"It is safe to say that the value to the steam fitting trade of the fixing of that schedule has been greater than all the expense or cost of the association since its incorporation. It must be apparent that it would have been impossible to accomplish this by individual effort. Only a large organized body with great purchasing power was equal to the task.

"Another valuable piece of work done by the national association was that of bringing about the adoption of the '1915 U. S. Standard Schedule of Flanged Fittings and Flanges.'

"The annoyance and expense caused by the variations in different makes of standard and extra heavy flanged fittings became unbearable, and the matter was placed in the hands of our committee on standardization by a resolution adopted at the seventeenth annual convention, held at Atlantic City, N. J., in June, 1905.

"The subject was a very difficult one. The cost of the time spent on the problem by men whose time is very valuable would amount to many thousands of dollars if charged for at their regular prices.

"The work was carried on in the face of many obstacles, and at last, after many years, we now have a *standard* which provides that for which we persistently fought; to wit, the interchangeability of flanged fittings. Its benefits will be enjoyed by the whole fraternity and their clients, the consumers.

"Thus it can be seen that the national association, in connection with other engineering bodies, but on its own initiative standardized flanged fittings and flanges, and is still engaged in the work of standardizing boiler ratings; radiator valves, and other materials entering into the construction of steam and hot water heating systems, all of which the committee on standardization will make reference to in its report."

At the conclusion of the president's address, the following committee appointments were announced:

Credentials: Otto A. Wurm, Michigan; M. J. Callahan, New York; Frank

CONVENTION GROUP OF THE NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS, IN FRONT OF THE AUDITORIUM, MILWAUKEE, WIS.

Downey, Wisconsin; J. F. Garvey, Iowa, and C. F. Little, Ohio.

Nominating: A. E. Kenrick, Massachusetts; F. H. Meadows, Wisconsin; P. F. Maginn, Pennsylvania; John T. Sadler, New York, and E. B. Harris, Utah.

Constitution and Rules for Convention Procedure: N. L. Danforth, New York; G. F. Reeke, Wisconsin, and C. P. Tietze, Michigan.

Appeals and Grievances: F. G. Carthey, Utah; E. Tunstead, Minnesota, and William Hunter.

Association Improvement: E. T. Child, New York; Chris. Sodemann, Missouri; and E. H. Sonneman, Wisconsin.

Auditing: Charles Geoghegan, New York; Stewart A. Jellett, Pennsylvania, and William H. Curtin, New York.

Distribution of Reports: E. D. Smith, New York; Albert Luebke, Wisconsin, and D. F. Edwards, Missouri.

Resolutions: William H. Curtin, New York; Walter A. Lawson, New Jersey, and Fred Kaufman, Wisconsin.

At the afternoon session, on Tuesday, June 22, a lecture was delivered by William Mather Lewis, field secretary of the Navy League, on "Peace Insurance," in which the speaker made a plea for a more adequate system of naval defense.

This address was followed by the report of the Committee on Standardization. After referring to the work in connection with the establishment of the "1915 United States Standard Schedule of Flanged Fittings and Flanges," and the publication of the schedule in chart form by the association, the committee reported progress in the standardization of radiator valves and in standard specifications for cast iron heating boilers.

Secretary Henry B. Gombers presented his report at this meeting and this was followed by the report of the treasurer, Juan A. Almirall. The convention then went into executive session.

A short open session was held Wednesday morning, June 23, when the convention was addressed by Charles K. Foster, vice-president of the American Radiator Co., speaking as a representative of the National Boiler & Radiator Manufacturers' Asociation. The installation of officers was made at the Thursday morning sesion, all of the officers being re-elected, with the exception of Otto A. Wurm, of Milwaukee, a member of the board of directors, who was succeeded by Julius A. Ziesse, of Grand Rapids, Mich. The officers as elected are:

President, John T. Bradley, St. Louis; first vice-president, Juan A. Almirall, New York; second vice-president, Frank G. Carthey, Salt Lake City; third vice-president, Edmund Grassler, Milwaukee; treasurer, J. E. Rutzler, New York; sergeant-at-arms, John C. F. Trachsel, Philadelphia.

Board of directors: William H. Oakes, Boston, chairman; Noble P. Bishop, New Haven; John T. Bradley, St. Louis; Frank G. Carthey, Salt Lake City; N. Loring Danforth, Buffalo; Edmund Grassler, Milwaukee; Juan A. Almirall, New York; J. E. Rutzler, New York; and Julius A. Ziesse, Grand Rapids.

CHANGE IN TRADE RESOLUTIONS.

The important change referred to in connection with the association's "Trade Resolutions" consisted in the omission of the following from the former resolutions:

"Those manufacturers and wholesale dealers who are in accord with us in this belief we look upon as our friends; our interests are mutual, and we shall use our best efforts to advance such mutual interests.

"For the information of the craft and the benefit of our friends we may, upon satisfactory evidence of the facts, print their name in our Official Bulletin, under the heading of 'List in Accord.'"

The full "Trade Resolutions" as adopted at the Milwaukee convention are as follows:

"The members of this association believe in trade protection. By trade protection we mean that manufacturers of, and wholesale dealers in, materials which enter into the construction of heating and ventilating systems, steam power plants and other pipe work done by those engaged in this craft, shall sell such materials for use in such work to those only who are regularly established in our line of business, and shall leave the preparation of plans and specifications to the heating contractor, the architect and the engineer. We shall endeavor by every

legal and legitimate means to further trade protection."

The Entertainment.

In addition to the regular entertainment programme a number of private dinner parties served to fill every spare moment during the convention. The following are the more formal entertainment features.

Tuesday at noon the ladies to the number of one hundred were luncheon guests of the Milwaukee Association in the Colonial Room of the Hotel Wisconsin. The souvenirs consisted of boxes of bon-bons, silver spoons and post card sets. The luncheon committee was ably assisted by Arthur Ritter and H. G. Issertell, of New York, in carrying out the arrangements. At the conclusion of the luncheon Mrs. Halsey expressed the thanks of the Western ladies and Mrs. Henry B. Gomers spoke for the Eastern ladies present. On motion of Mrs. A. F. Sheahan, a toast was then drunk to the health of the Milwaukee committee.

In the afternoon the ladies were taken in a body to the "movies."

The "big night" of the convention was the same evening and took the form of a carnival cabaret, the host being the American Radiator Co. The diners donned carnival paper caps of all conceivable patterns and proceeded to make merry with music and dancing to add to the festivity. Advantage was taken of the occasion to present Charles K. Foster, general manager of sales of the American Radiator Company, with a silver-plated miniature automobile in appreciation of his faithfulness as a convention goer. It was pointed out that Mr. Foster has attended 26 out of the 28 conventions held by the master fitters.

President H. W. Ellis of the Johnson Service Co., of Milwaukee, was the recipient of a jardiniere and 7 ft. palm, presented to him by the Milwaukee Association in recognition of his interest and assistance in carrying out the entertainment programme.

Another recipient of convention honors was William G. LeCompte, of Jenkins Bros., New York, "perennial chairman of the entertainment committee," who was presented with a set of cuff buttons by "twelve brother Elks." This presentation was made by Judge John C. Karel, of Milwaukee, and his reference to an imaginary part played by Mr. LeCompte as a dummy in connection with a story he told, was responsible for a characteristic response by Mr. LeCompte, who acknowledged his thanks in a manner befitting a dummy, his speech being entirely in pantomime. Needless to say, it brought down the house.

On Wednesday afternoon, the entire convention party was taken in some 70 automobiles for a pleasure trip about the city. Banners were attached to each automobile bearing the title of the association, and the cavalcade made an impressive showing as it swung through the streets. A stop was made at the Elks Club, where a light luncheon was served.

In the evening the annual bowling matches were held at Kurtz's Bowling Academy. The master fitters' team, consisting of Messrs. Stohr, Pellinick, Downey, Mueller and Dusold, won from the supply men with a margin of 101 pins. The supply men's team was composed of Messrs. Somers, Ritter and Witt. The winners in the ladies' bowling match were Mrs. Wenzel, first prize; Mrs. John T. Bradley, second prize; Mrs. Christie, third prize; Mrs. Noerenburg, fourth prize; Mrs. Osborne, fifth; Mrs. Zuelke, sixth; Mrs. Freeman, seventh; Mrs. Shaw, eighth; Mrs. Sonnerman, ninth; Mrs. Wagner, tenth; Mrs. Yunghaus, eleventh, and Mrs. Callahan.

Following the final adjournment of the convention Thursday morning, the members and guests in the afternoon were taken on a boat ride on Lake Michigan as the guests of the Johnson Service Company. A special boat was chartered for the occasion and the party numbered over 200. During the trip the winners of the bowling matches were presented with their prizes. A band was on board and soon the upper deck was cleared for dancing, which was generally participated in. A light luncheon was also served during the ride.

The Milwaukee committee, which did so much to make the convention a success, was easily distinguished by the uniform dress of its members. The full committee comprised the following: H. Dearsley, H. Franke, S. Thompson, W. E. V. Shaw, F. Downey, M. Mueller, W. A. Bowers, H. Sohns, F. Mueller, R. Zuelke, R. G. Wenzel, J. Christie, A. F. Bowers, B. Freeman, J. Volk, R. Kelleman, O. Juttner, R. Lade, C. J. Fox, J. Saxer, H. S. Bowers, W. Noerenberg, I. Harriman, E. A. Netz, S. May, F. H. Meadows, E. Grassler, A. Luebke, F. Kaufman, E. Henoch and A. J. Striebel.

The Exhibitors.

C. A. Dunham Co., Marshalltown, Ia., had a room reserved in which the Dunham steam traps and other devices used in this system of heating were on exhibition. The representatives of the company were George W. Best, manager, and C. L. Chase.

Consolidated Engineering Co., Chicago, Ill., had a duplicate of its display at the recent

convention of the National District Heating Association. Those on hand in the interest of the company were B. E. Van Auken, president; John F. Hale, vice president; Roy Van Auken, C. E. Greenfield and A. H. Probst.

H. W. Johns-Manville Co., New York, showed its line of pipe coverings and boiler insulation. The company was represented by C. A. Holmes, Otto Gahns, A. L. Klug, H. P. Meyer, E. J. Holzhausen and A. H. Pierick.

Boylston Steam Specialty Co., Chicago, Ill., exhibited full sized models of its vacuum pump governors, pressure regulators and steam traps. John Boylston had charge of the company's exhibit.

Dolve Valve Co., Chicago, had samples of the Dole packless radiator valves on exhibition. The exhibit was in charge of T. H. Tweed.

Johnson Service Co., Milwaukee, Wis., passed around attractive note books, bound in red leather. On the boat trip on Thursday, the company presented souvenir thermometers to the ladies on board, while the men were given attractive paper weights.

Convention Notes.

One of the interesting informal gatherings of the convention was the reunion of the "old guard," in the rooms of William G. LeCompte, of the entertainment committee, on Monday evening. Later in the evening the "old guard" and a number of others were the guests of the Consolidated Engineering Company at a cabaret and midnight dance in the grill room of the Charlotte Hotel.

One of the events of the boat trip on Thursday was the presentation of a silver loving cup to Edmund Grassler, and a silver cigarette case to A. H. Meadows, both of the Milwaukee entertainment committee, in appreciation of their efforts toward the success of the convention. The presentation was made by E. L. Downey, on behalf of the Milwaukee committee.

A trip to the Pabst breweries for the ladies was an event not on the regular programme but one which proved decidedly interesting. J. Barton Garfield, of the entertainment committee, accompanied the party. The entire process of the manufacture of beer was shown and explained by the Pabst company's guides.

Before the convention disbanded William G. LeCompte was re-elected chairman of the manufacturers' entertainment committee, and J. Barton Garfield was re-elected secretary and treasurer.

The record of the convention would not be complete without a note of the fact that Alfred E. Kenrick, who never misses a convention, was in his accustomed place. Past President E. D. Smith, of New York, was also present and officiated at the installation of the officers.

Prize for Best Essay on Sanitary Arrangements on Board Ship.

Announcement is made that the Royal Sanitary Institute, of London, this year will offer the Henry Saxon Snell prize, consisting of $255.00, and the silver medal of the institute, for the best essay on "Suggestions for Improvements in the Sanitary Arrangements and Appliances Suitable on Board Ship for Passengers and Crew and for Cattle and other Live Stock." Special consideration will be given to suggestions for ventilation, heating and cooling, sanitary conveniences, water supply, sleeping quarters and store and feed rooms. Essays must be delivered on or before November 1, 1915. Details may be obtained by addressing E. White Wallis, secretary of the Royal Sanitary Institute, 90 Buckingham Palace Road, London, S. W., England.

To Market American Products in Belgium.

Announcement is made of an organization of Belgian business men in England to introduce in Belgium, as oson as the European war is over, American products and manufactures and, also, to employ as agents, representatives, etc., a large number of Belgian manufacturers and business men who have been partly ruined but who still possess enough capital and can give the necessary guarantees as agents, dealers, etc. The organization is being developed by Willy Lamont, of Antwerp, Belgium, whose temporary addres is Shardhighs, Halstead (Essex), England.

"Home Electrical" at the Panama-Pacific International Exposition.

A novel exhibit at the Panama-Pacific International Exposition is the "Home Electrical" in the Palace of Manufacturers. This is a full-sized model home in which electricity is made to perform the domestic tasks and labors. Electricity cooks, washes, launders, sweeps, dusts and fulfills countless other household duties, and it also heats, lights and cools the house.

This is one of the exhibits of the General Electric Company. The home is in no sense an exhibition to demonstrate the radical things that may be done with electricity in a house, all of the electrical devices shown being suitable for the average family.

Honeywell Heating Specialty Co., Wabash, Ind., in accordance with a recent announcement, will hereafter use brazed or welded expansion tanks in connection with its tank-in-basement method of hot water heating.

THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

CONDUCTED BY IRA N. EVANS, C. E.

47—Air Cooling With Water.

QUESTION: How much water at an initial temperature of 70° F. will it require to cool 200,000 cu. ft. of air and steam at 300° F. to 100° F., if the weight of the vapor is 0.00898 lbs. per cubic foot, and the time interval one minute?

ANSWER: The barometer is 29.88 in. mercury or 14.67 lbs. pressure. The weight of vapor is 200,000 cu. ft. x 0.00898 = 1796 lbs. The weight of dry aid will be the total, less the 1796 lbs. of vapor at the volume of the pressure and temperature given, multiplied by the weight per cubic foot at that pressure and temperature.

The condition, volume per pound, and total heat of the vapor, from a steam table, is as follows:

Volume per pound, 30.57 cu. ft. Total heat above 32° at 100° F., 1103.6°. Latent heat of evaporation, 1035.6 B. T. U. per pound.

The volume of the vapor is 1796 lbs. x 30.57 cu. ft. = 54,903.7 cu. ft. 200,000 cu. ft. — 54,903.7 = 145,096.3 cu. ft. dry air at 300° F. The weight of dry air at 14.7 lbs. pressure and 300° F. is as follows per cubic foot: The weight of dry air at 0° is 0.086354 lbs. per cubic foot at 14.6963 lbs. 14.67 ÷ 14.6963 = 0.9982 of the volume. The volume due to change in temperature, is, at 300°, 460 ÷ 760 = 0.6053.

The weight of dry air at 300° F. is 0.86354 x 0.6053 x 0.9982 = 0.05217 lbs. per cubic foot. 145,096.3 x 0.05217 = 7569.7 lbs. dry air. The heat required for the dry air will be 7569.7 (air) x 200 x 0.2375 = 359,560.75 B. T. U. 1796 (vapor) x 88 B. T. U. per pound = 158,048 B. T. U.

At 100° F. the water vapor per pound of air is, at saturation or dew point, 0.04304 lbs. per pound. 7569.7 x 0.04303 = 325.8 lbs. The vapor condensed at 100° saturation will require 1796 — 325.8 = 1470.2 lbs. 1470.2 x 1035.6 B. T. U. = 1,522,539.12 B. T. U.

The total B. T. U. per minute will be:

Air	359,560.75
Vapor	158,048
Vapor condensed	1,522,539.12
Total	2,040,147.87

If the water is heated from 70° to 100° F. the pounds of water required will be, per minute: 680,049 ÷ 8 1/3 gal. = 8200 gal. per minute. 10% to 20% should be added to this on account of the efficiency of the spraying apparatus. If the water is thoroughly atomized, the less water will be required up to the theoretical amount.

If the apparatus is arranged on the counter current principle, ringing the coldest water in connection with the cooler gases, the water may be heated from 70° to 200° F. or through 130°. There will then be required 30 ÷ 130 = 23%, or 1886 gal. per minute, instead of 8200 gal.

Heating surface may be provided for water and gas or the water may be pumped through twice. Still another method would be to raise the temperature in two stages.

Current Heating and Ventilating Literature.

DUST REMOVAL—

The Removal of Dust from Machines. F. R. Parsons. Design and installation of dust-removal plants. Ills. 1500 w. Prac Engr—March 25, 1915. 40c.

FACTORIES—

Heating and Ventilating System of American Cigar Co.'s Plant. W. L. Durand. Example of modern tendencies. Ills. 1200 w. Power—April 6, 1915. 20c.

FANS—

The testing of Ventilating Fans. Thomas Bryson. With special reference to the measurement of pressure. 2000 w. Col Engr—April, 1915. 40c.

STEAM PIPES—

Piping and Supports in Municipal Plant. A. D. Williams. Unusual features. Ills. 900 w. Power—April 6, 1915. 20c.

Stresses in Steam Pipes. S. U. Tuspin. Forces set up by expansion and necessity of providing for them. 1000 w. Elec Wld—April 10, 1915. 20c.

Supporting Steampipe Lines. F. R. Parsons. Suggestions for avoiding leakage troubles. Ills. 1000 w. Mech Wld—April 9, 1915. 40c.

LEGAL DECISIONS

Modification of Contract By Correspondence and Payment.

A building contractor contracted with a subcontractor to install a heating plant for which the latter was to receive $2,075, of which $1,000 was to be paid upon the completion of the work, and the balance on the 15th of December, 1910, the work to be finished on the 15th of October, 1910. On the 5th of October, 1910, the heating plant had been completed with the exception of putting in a certain boiler which the contract called for, the shipment of which had been delayed by the manufacturers thereof from whom the subcontractor had ordered it. On that day the subcontractor wrote the contractor requesting payment of $1,000 on the job, but recognizing that under the terms of the written contract no payment was due until the work was completed, and reciting the fact that it was all completed except furnishing and setting the boiler which had been delayed by the boiler manufacturers, who had promised to ship it that week, and that it would be installed within a few days after its arrival. On the 10th of October the contractor paid the subcontractor the $1,000 requested. On the 21st of October, before the boiler had arrived, the building was destroyed by fire. The contractor subsequently sued to recover the $1,000 paid. It was held that the correspondence and payment modified the contract, so that the payment must be given the same effect as if it had been provided for in the original contract, and there was no implied promise on the part of the subcontractor to repay the money because of the destruction of the building.—Peck-Hammond & Co. vs. Miller, Kentucky Court of Appeals, 175 S. W. 347.

Covenant to Heat Premises—Slight Breach—Notice to Landlord.

In an action for rent due on a written lease of an office building, from which the lessee had moved out before the termination of the lease, the jury returned a general verdict for the defendant on the theory that he had a right to vacate the premises because of the failure of the plaintiff to heat the leased rooms according to the provisions of the lease. On appeal, the court said that, while the numerous cases dealing with covenants to heat leased premises are not all in harmony, the following propositions are supported by reason and authority:

1. A mere slight temporary inconvenience to the tenant does not justify him in throwing up his lease. A trivial breach is not sufficient, but the breach must be substantial and of such duration that it can be said that the tenant has been deprived of the full use and enjoyment of the leased premises for a material period of time.

2. The landlord is entitled to notice to the effect that the heat contracted for is not being furnished, and has a reasonable time after notice is given to remedy the defect complained of, and until such time has elapsed the tenant has no right to quit the premises because of the alleged breach.

It is not easy to avoid some fluctuations in heat in a climate like that of Wisconsin. The facts were peculiarly within the knowledge of the tenant. If he was being deprived of the full beneficial use of the space he had leased, it was his busines to say so, and it was the busines of the landlord to remove the cause of complaint. But until a complaint was lodged, and the lessor failed within a reasonable time to remedy the trouble complained of, the tenant was not at liberty to treat the lease as terminated. The defendant testified that at times he complained to the janitor of lack of heat. This was natural enough if more heat was desired when the complaint was made. The building was not leased from the janitor, however, and there was nothing to show that he was an agent of the owner for the purpose of receiving notice that the terms of a lease were being violated, any more than he was for the purpose of receiving rent. The agents in charge of the building were well known to the defendant, and occupied the office directly under the one used by the defendant. Rent was paid monthly to these agents for more than two years, and the court thought that an important notice of the kind here involved should have been served on them, rather than on the janitor. But if the agents were chargeable with knowledge of what had been communicated to the janitor, the defendant had not shown any sufficient reason or justification for vacating the premises. Judgment for the defendant was reversed and ordered to be rendered for the plaintiff.—Northwestern Realty Co. vs. Hardy, Wisconsin Supreme Court, 151 N. W. 791.

No Liability for Negligence of Independent Contractor.

A radiator company employed a transfer company to make deliveries for it. The transfer company exercised an independent calling, routed the deliveries, took other deliveries with those of the defendant, received an agreed compensation per hundred

weight, and the defendant exercised no control over it. A driver, in making a delivery, negligently left some radiators on the sidewalk space and a pedestrian fell over them and was injured. In an action in which the case as to the radiator company was dismissed, it was held that the transfer company was an independent contractor and the radiator company was not liable for the doctrine of respondent superior.—Winters vs. American Radiator Co., Minnesota Supreme Court, 151 N. W. 277.

Features of Nineteen Typical Heating Franchises.

In the report of the station record committee, at the recent convention of the National District Heating Asociation, interesting features were tabulated of nineteen typical heating franchises for central station heating plants. Following are some of the more important facts brought out:

In all of the cities authority was granted to occupy the streets. The terms of the franchises varied from 20 to 50 years, 25 years being the usual term. In a few cities authority was granted to connect to the public sewers. In four cases the authority granted was for a restricted territory only.

Regarding conditions and restrictions, the grant is often subject to the city laws and the city generally approves the location of mains. In one case the city reserved location for the company for six months. The city generally approves construction in the streets. In six cases permits for construction had to be obtained.

In regard to proving and sealing all meters at desire, and to test meter on consumer's request, only one franchise had this provision. The fee for such test was $1.00 and the allowable variation in accuracy 2%.

It is usually specified that the companies are not to interfere with present pipes in streets, that they are not to unnecessarily impede streets and drains, that they are to use precautions to avoid accidents, to put up barriers and lights, not to do permanent injury to streets or trees, and to restore streets to their original state of usefulness.

The requirements regarding the opening of trenches at one time vary from "not more than necessary" to "500 ft." "one week" and "15 rods." In two of the franchises it was specified that the company was not to stop traffic in the street more than six days and ten days, respectively. Three franchises called on the company to refill trenches in the manner specified.

Regarding the maintenance of repaving, this was mentioned in but two franchises. In one case the time specified was one year and in the other no time was specified. Some of the companies agreed to pay for the city repaving where the city so desired.

Seven companies agreed to file maps of their underground work with the city, one franchise reading "annually." Six companies agreed to remove or change construction at the city's order. The time limit for beginning construction ranged from two months to one year, the company in the latter case agreeing to spend $100,000 on mains within that time. The time limit for beginning heating service varied in an interesting manner, as follows:

One year, 2,000 ft.; one year; one year, 1½ miles; eleven months; eighteen months; 21 months, ¾ mile; sixteen months, 50 buildings; 18 months; 10 months; six months, 1 mile; 14 months; 18 months, ¼ mile; and 12 months.

In two instances the franchises had clauses that the company was not entitled to damage from work done by the city. One franchise specified that the company was to use modern and effective appliances, while another contained clauses that it was to use standard improvements on mains and that it was to employ only union men when available.

Four of the franchises required bonds or deposits against failure to begin construction within the time limit. These were fixed at $10,000, although in one case $500 was the amount mentioned. Bonds against all damages to the city from company operation were required in nearly all cases, the amounts ranging from $1,000 to $25,000. Four companies were required to give a continuing guarantee on paving repair, amounting in one case to $500, and, in the other three cases, to $1,000.

A curious requirement in one franchise was that the company should pay a city sinking fund tax of 3 cents per foot of main, the total of such payments not to exceed $100,000. In several cases the special taxes were arranged on a percentage of the gross receipts, amounting to from 2% to 5%.

One company secured a clause providing for a penalty for injury to the company's equipment or operation. Another franchise had a penalty clause where steam fitters did not get the company's permit for changes.

In only one case was it provided that the company was to establish rules for the customer's equipment and to fix the amount of the radiation. In only one case, also, was a cooling coil required.

The heating season, according to three franchises, was from September 15 to May 15; from October 1 to June 1; and from September 20 to May 20. Two franchises

Exhibit of the Consolidated Engineering Company, of Chicago, Ill.

Exhibit of American District Steam Company, of North Tonawanda, N. Y.

VIEWS IN THE EXHIBIT HALL AT THE RECENT CONVENTION OF THE NATIONAL DISTRICT HEATING ASSOCIATION.

had provisions for reductions of charges for insufficient heat.

As far as rates are concerned, there is a clause in one franchise that the rate was to be the same per square foot to all consumers. In another it was specified that there should be a maximum rate per square foot. Such maximum rates were given in five of the franchises as follows:

Thirty-five cents for steam and 20 cents for hot water; 20 cents; 17 cents; 30 cents for steam and 20 cents for hot water; and 6 cents per month. In two cases the maximum rates were given per 1,000 cu. ft. of space, the figures being $4.00 and $6.00, respectively.

The maximum rate per 1,000 lbs. of steam was mentioned in three franchises as follows: 75 cents, etc., to 45 cents; 50 cents; 65 cents. The rate to the city for municipal buildings was mentioned in five franchises, ranging from "free heat" to "city hall free," "minimum price," "city hall one-half average" and "20% less."

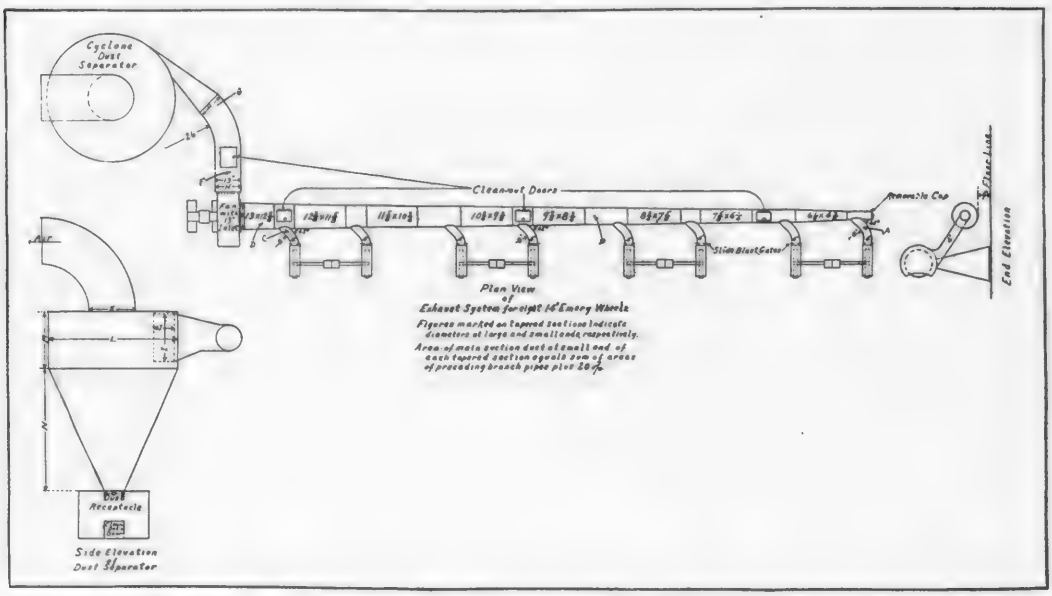
In three cases it was agreed that rates may be fixed by the city, one franchise adding the clause "at five year periods." One of these franchises had the further provision that 20% of the users must sign such a petition and that a net profit of 10% must be allowed in fixing the rates. One franchise only provided for arbitration in settling rates.

In four cases the service company was to furnish all near mains. Regarding extensions, one franchise had a clause that the mains must have sufficient capacity. Four franchises had clauses regarding the business per foot of main before extending. These ranged from "user each 75 ft.," "700 cu. ft.," "agree with city" and "reasonable." Regarding free extensions to curb and lot lines, two franchises specified "curb" and one, "lot." One franchise stated that the company must extend all services to curb line on order.

On the subject of exclusive franchises, this was mentioned in four cases and prohibited in each case. In three cases, there was mention of purchase by the city and the method was specified. The franchises averaged from 250 to 3,200 words in length.

New Rules Promulgated by the New York State Industrial Commission.

Four bulletins recently issued by the Industrial Commission of New York State have recently been published. They contain new rules relating to the sanitation of factories and mercantile establishments; to the equipment, maintenance and sanitation of foundries; to the milling industry and malthouse elevators; and to the removal of dust, gases and fumes. The latter is the most recent of the rules, having become effective May 15, 1915. This bulletin goes into the matters of hoods, size of branch pipes, size of main pipes and fan inlets and outlets, suction, arrangement and construction of pipes, clean-out doors, dampers and fire doors, ventilation, belts, and plans. The


Cyclone Dust Separator
Cleanout Doors
Plan View of Exhaust System for eight 14" Emery Wheels
Figures marked on tapered sections indicate diameters at large and small ends respectively.
Area of main section dust at small end of each tapered section equals sum of areas of preceding branch pipes plus 20%.
Air
Receptacle
Side Elevation Dust Separator
Slide Blast Gates
Automatic Cap
End Elevation

TYPICAL PLAN, ENDORSED BY NEW YORK STATE INDUSTRIAL COMMISSION, OF EXHAUST SYSTEM FOR EIGHT 14-IN. EMERY WHEELS.

foregoing apply to grinding, polishing and buffing wheels.

Additional rules are given for machines creating dust or fumes; fumes, vapors or gases; lead dusts and fumes.

Under recommendations for the size of the cyclone separator or dust collector, a table is reproduced giving dimensions of separators stated to be suitable for metallic dusts and wood shavings. It is stated that the separator should be selected the area of whose inlet is at least as large as the area of the discharge pipe from the fan. For light buffing dusts, lint, etc., the air outlet from the top of the separator should be so large that the velocity of discharge will not exceed 300 to 480 ft. per minute; a separator should be selected of which the other dimensions are proportionate. The air outlet should be provided with a canopy or elbow to exclude the weather, but should be otherwise unobstructed. There should be ample clearance under the separator for the accumulation or storage of the dust, which should never be allowed to pile up as high as the botom of the separator.

The bulletin contains a drawing, which is here reproduced, showing an exhaust system laid out in conformity with these specifications for eight 14-in. emery wheels. The branch pipes would have to be not less than 4½ in. in diameter. It is pointed out that the installation for buffing wheels would have to be considerably larger in many respects. The bulletins are published from the headquarters of the Industrial Board, at 381 Fourth Avenue, New York.

National Warm Air Heating and Ventilating Association.

Fifty members of the National Warm Air Heating and Ventilating Association attended the organization's annual meeting in Detroit, Mich., June 9. In opening the meeting President John D. Green presented an earnest plea for greater publicity of warm air furnace heating through an organized publicity campaign. The balance in the treasury as reported by Treasurer W. G. Wise, was $1,267. Secretary Allen W. Williams stated that one of the most important accomplishments of the past year had been the compilation of a mailing list of dealers. About 20,000 names were sent in, containing some duplicates. The names have all been sorted alphabetically by States and cities and all duplications eliminated. It is the intention of the association to furnish copies of this list to its members.

One of the interesting papers read at the meeting was that presented by Professor Arthur C. Willard of the University of Illinois, on "Testing Warm Air Furnaces for Efficiency and Commercial Ratings."

All of the officers were re-elected as follows: President, John D. Green, Detroit, Mich.; vice-president, F. T. Giblin, Utica, N. Y.; treasurer, W. G. Wise, Akron, O.; secretary, Allen W. Williams, Columbus, O.; executive committee: John A. Howard, Dowagiac, Mich.; E. P. Miller, Marshalltown, Ia., and Charles Seelbach, Cleveland, Ohio.

Other papers read at the meeting were: "Bearing of Codes on Warm Air Heating," by Frank K. Chew, and "Combustion in Heating Apparatus," by R. A. Davenport. The report of the committee on legislation and building code was allowed to go over. The proposed code provided, among other things, for official inspection and probable inspection fees and it was thought the association should proceed carefully in this matter.

NEW DEVICES

A New Magazine Feed Boiler.

An important addition to the line of magazine feed boilers is announced by the Newport Boiler Co., 6312 Wentworth Avenue, Chicago, Ill. It is known as the Newport adjustable magazine feed boiler, being designed especially for homes and apartment buildings where maximum heating results must be obtained with a minimum of attention and expense. The inventor is Charles F. Newport, for many years manager of the Ideal Heating Co., of Chicago. Several installations have already been made in Chicago and vicinity and the company is issuing an impressive list of testimonials regarding its economical features and ease of operation.

One of the most noteworthy features of this boiler is the low height of its water line, which is 40½ in. in steam boilers as large as 2,100 sq. ft. capacity. This is a point that is of special advantage where the basements are low, or when using vapor systems, indirect radiators, etc. Its coal magazine is stated to be larger than that of any boiler of the same type. In this connection, the coal doors are comparatively low, which contributes to the ease of firing.

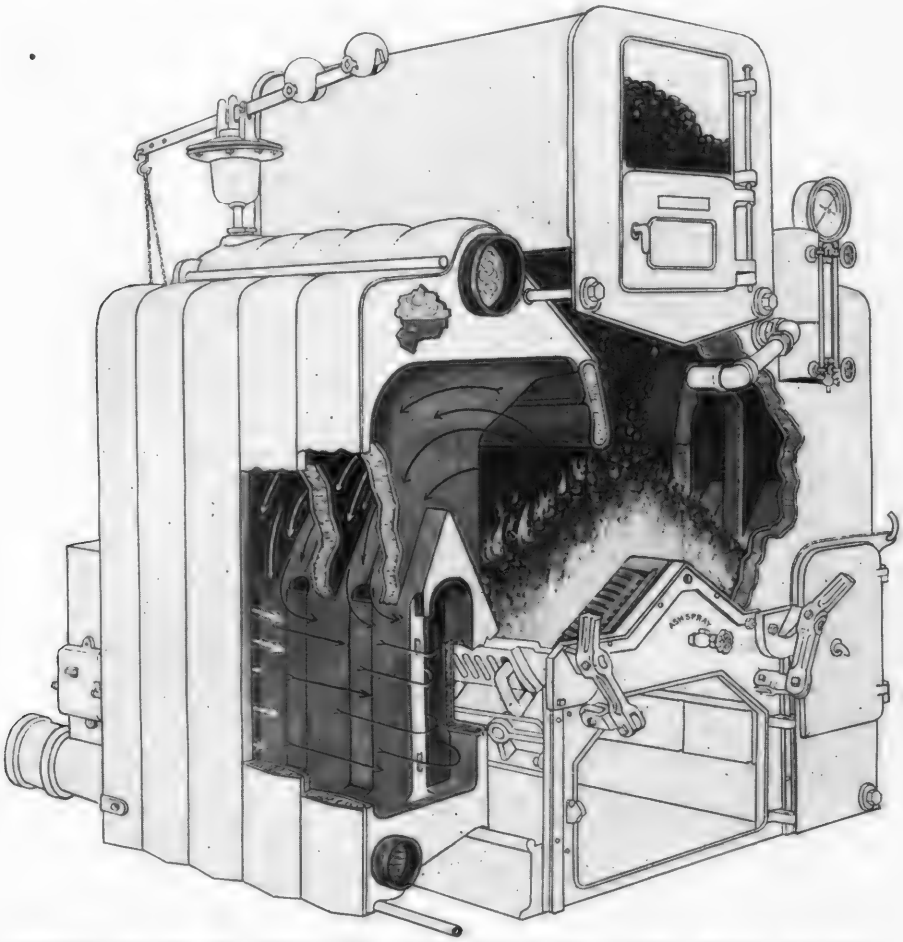
The manufacturers call special attention to the adjustable water cooled magazine throat, which permits the burning of large sizes of coal and coke, as well as the smaller and cheaper sizes of hard coal and coke.

In other words, the size of the throat may be adjusted according to the size and kind of fuel being burned. It is also possible to use one side of the grate in mild weather. In addition, the flue travel on the Newport boiler is adjustable. This is accomplished by removing the flue plates located in the flues, short-circuiting the gases into the smoke outlet, thereby raising the temperature of the flue and increasing the draft. In this way the boiler may be made to work fully up to the capacity of the flue to which it is attached.

The sloping grate of the Newport boiler is self-cleaning, so that the sifting of ashes is unnecesary. The greatest accumulation of ash in a boiler of this type is at the lower end of the grate. In this boiler the connecting bar is placed above the grate. This bar has openings for the admission of air, the same as the grate, while on the inside are located ribs for the purpose of agitating the fire more violently in this corner when the grate is gently shaken, thereby evenly cleaning the grate.

Still another feature emphasized by the manufacturers is the ash pit spray. A water spray, by a turn of a valve, sprinkles the ashes so that their removal is not accompanied by the usual clouds of dust.

The Newport boiler is equipped with an exclusive patented combined check and draft, balanced by the adjustment of the regulator weight. The hottest gases first come in contact with the crown sheet and overhanging fire surfaces. They then follow downward between the sections into the outside flue, then forward into the inside flue from which they pass rearward to the smoke box, thus leaving the boiler at the coolest part. The flues are located below the fire in the coolest part of the boiler in order to absorb more heat from the gases.



CONSTRUCTION OF NEWPORT ADJUSTABLE MAGAZINE FEED BOILER.

Rapid water circulation in the boiler is secured by means of the vertical unob-

structed thin waterways located above the fire and in the flues.

New High Pressure Pyrometer Instruments.

A new line of high pressure resistance thermo-electric pyrometers for temperatures up to 3000° F. is being placed on the market by the Bristol Co., Waterbury, Conn. The millivoltmeter movements of these new instruments are all of the pivot jewel bearing dead beat type and are made by the Weston Electrical Instrument Company especially for use with thermo couples. These instruments may be used with Bristol patented base metal couples for measuring temperatures up to 2000° F., and with standard platinum rhodium couples or the Bristol patent compound couples with platinum rhodium tips for measuring temperatures up to 3000° F.

Fig. 1 is an illustration of the switchboard, or wall type, high resistance model 319, and Fig. 2 shows the portable high resistance model 322. The instruments are provided with zero adjusting devices which afford a simple and quick way of adjustment for different "cold end temperatures" and as the movements are of the pivot jewel-bearing type, they are not affected by ordinary vibrations in shops. Switchboard model 319 is provided with a normal index which can be set at any desired point on the scale. Portable model 322 weighs about 6 lbs. and 6 oz. It is stated that when the instruments are calibrated for a scale range of 2000° F. for use with base metal couple or for a range of approximately 65 M. V., the resistance would be upward of 350 ohms and the temperature error would consequently be less than 1 per cent. for a change of 75° F. This extremely high resistance also makes these instruments practically independent of length of leads and lengths of couples. The high sensibility also makes them available for low ranges of temperature where an open scale is required.

FIG. 1. SWITCHBOARD OR WALL TYPE OF PYROMETER.

FIG. 2. PORTABLE HIGH RESISTANCE MODEL.

The Hillegass Portable Hand Pipe Reaming Machine.

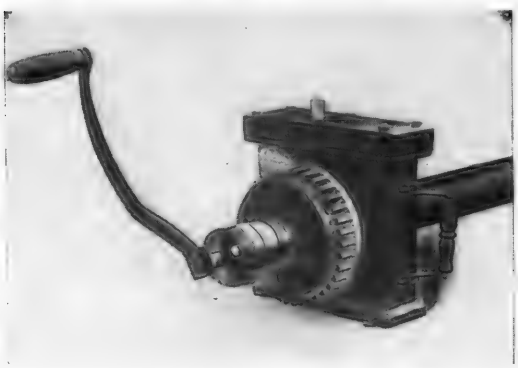
The machine, shown in the accompanying illustrations, is a new and original device, being the first portable hand reamer put on the market for pipes larger than 1 in. in diameter. Mr. Hillegass, the inventor, during his forty years of experience in the pipe fitting trade, has long felt the necessity for a practical portable pipe reaming device. This machine is equally adaptable for use in piping for water, steam, gas or vacuum, and the inventor particularly recommends its use in iron conduit work for concealed electric wiring.

The Hillegass portable hand pipe reaming machine weighs 25 lbs. and reams nine sizes of pipe—¾-in. to 4-in., inclusive. It is constructed of maleable iron and steel castings. The cutting reamers are of high carbon steel. The jaws will take in a 4-in. coupling, making it possible, by using the coupling as a nipple holder, to ream a 4-in. nipple.

PORTABLE HAND PIPE REAMING MACHINE.

The machine is attached to a pipe in a manner similar to any hand threading machine, by means of self-centering chuck jaws. These jaws are so designed as to have the necessary advantages of an expensive universal chuck, and yet the construction is sufficiently simple so that it is inexpensive to build and to keep in repair. The cutting reamer has a shaft which slides on two keys, or feathers, through the hub of the main gear and is carried forward into the pipe by means of a hand feed nut similar to that on a drill-ratchet. Thus the cutting reamer, in operation, has both a rotating and longitudinal motion. The main gear is actuated by a drive pinion, which is turned by a hand crank. Three revolutions of the hand crank make one revolution of the main gear.

Since the machine was first developed, it has been given a severe service test of over a year, under practical conditions, to determine weakneses and possibilities for improvement. So far it has done effective and rapid work at all times, showing no necessity for change in design. Machines will be put on the market about July, 1915, by the inventor and manufacturer, Henry Hillegass, Houghton, Mich.



PORTABLE PIPE REAMER ATTACHED TO PIPE.

A New Radiator Valve.

Two types of packless radiator valves for one-pipe gravity of vacuum heating systems, have recently been designed by E. H. Murphy, 1016 Marquette Building, Chicago, Ill., and are shown in the accompanying illustrations. The valve shown in Fig. 1 is adapted for use on hot water radiator and wall coils, and has been especially designed with a supply connection and control means at the top so that a person does not have to stoop to open and close the valve. The return connection is at the bottom of the radiator coil so that the water of condensation will drain from the radiator into the supply pipe through the water seal made intregral.

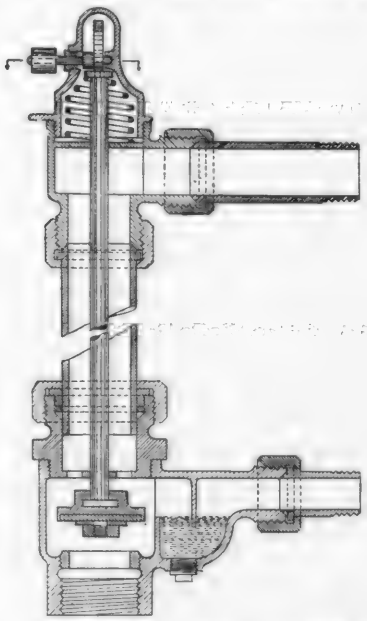


FIG. 1. NEW TYPE OF PACKLESS VALVE FOR HOT WATER RADIATORS AND WALL COILS.

The type of valve shown in Fig. 2 has the return and control at the bottom and can readily be adapted to supply the radiator either at the top or bottom.

These are positively opened or closed valves and cannot be stopped at any immediate point. It is possible with this valve to use radiators or coils of any length or size to guarantee a perfect circulation or a noiseless operation in both gravity and vacuum air line

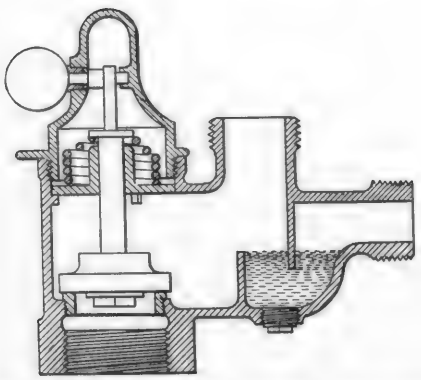


FIG. 2. NEW VALVE WITH CONTROL AND RETURN AT BOTTOM, ADAPTED TO SUPPLY AT EITHER TOP OR BOTTOM OF RADIATOR OR COIL.

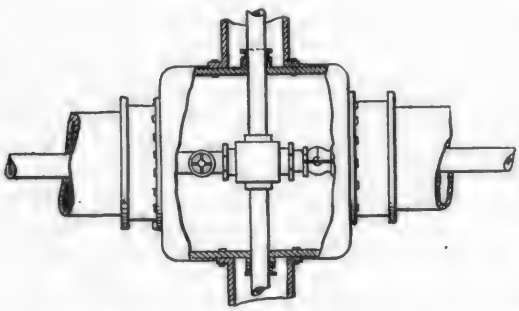
systems. The return or condensation is carried to a constantly balanced liquid seal located within the valve body or casing and from which condensation overflows into the supply pipe. One of the features of these valves is the prevention of noise and water hammer.

Heat Distributing Device for Central Heating Systems.

A heat distributing device, for use on central heating lines, which is designed to distribute and equalize evenly along the line any amount of steam that may be required, has lately been patented by Samuel R. White, Bloomington, Ill., and is illustrated herewith. The device consists of a high pressure pipe installed inside of the low pressure pipe, with automatic reducing valves placed on the high pressure pipe. This enables a high pressure to be carried a long distance and reduction made to the pressure desired at any point needed. In an installation of this system at the plant of the Utility Heating Co., in Bloomington, Ill., last winter, the inventor states that they saved the expense of enlarging 1,000 ft. of line that was overloaded and also reduced the pressure at the plant nearly one-half.

One of the advantages mentioned in connection with the use of this device is that it superheats the steam in the low pressure line. The system, it is stated, can be installed in any plant at a small expense, while new plants can be installed at considerably less expense. In addition, live steam for cooking or any purpose that requires a high pressure of steam, can be taken off at any point along the line.

The inventor is now negotiating to place the device on the market.



STEAM DISTRIBUTING DEVICE FOR USE ON CENTRAL HEATING SYSTEMS.

Car Ventilator with a Water Chamber.

A window ventilator for sleeping cars, in which use is made of a water chamber to cleanse the air of dust and soot, has been invented by a Pullman car porter, W. E. McMullin, and has been tried out for the past three months on the trains running between Minneapolis and Aberdeen. It has lately been installed on the Pioneer Limited, one of the crack trains of the Chicago, Milwaukee & St. Paul Railway.

The device consists of a ventilator which is placed under the sash. At the front end is an opening, 5 x 8 in., which admits the air from the outside. The air is then forced, by a series of three wheels, through a body of water, so placed in the ventilator that it cannot be spilled either into the car or outside. By the movement of the train the air is whipped through a constant spray of water and is thus washed and cooled before passing into the berth. A catch basin apartment in the ventilator receives all the dirt and other debris.

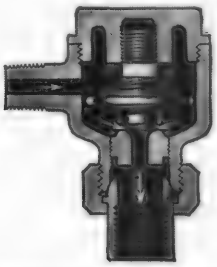
In addition to the installations mentioned, further tests are being made on the device by Mr. McMullin, L. J. Bussell and H. E. Bussell, on various sleeping car lines.

Novel Type of Air Line Valve.

Some unique features are embodied in the Marsh Thermodisk Paul air line valve, shown in the accompanying illustration. This valve is constructed entirely of metal. This includes the thermostatic diaphragm which is made of phosphor bronze, spun directly on the post at the top and the valve at the bottom, making a tight container for the volatile fluids and a sensitive diaphragm. The diaphragm is constructed to eliminate any possibility of rupture from alternate expansion and contraction, the

expansion being provided for in the corrugations. The edges consequently are free from excessive stress at all times. In this way the valve has but one movable part, opening and closing by means of the expansion and contraction of the diaphragm produced by the vaporization and condensation of volatile fluids which it contains. As will be seen from the construction of the valve, the air, on account of the large port, is eliminated freely. The port, however, is made so that it closes tightly on the arrival of steam.

The Thermodisk valve differs from the



MARSH THERMO-DISK PAUL VALVE.

Marsh original Paul air line valve, which, it is stated, was the original valve devised for the Paul system in that it has a metal diaphragm, while the old Marsh valve was made with a rubber composition expanding member. The manufacturers state that while the original Paul valve is still in extensive use, the new style of valve has been brought out to meet the popular demand, especially for certain installations. An important detail to which attention is called is that the Thermodisk valve in centers is interchangeable with the original Marsh air valve. In this way the valve may be applied promptly and without loss of time and cost of extra piping to the older installations as made with the Marsh original Paul valve. The manufacturers are Jas P. Marsh & Co., Chicago, Ill.

New Publications.

A STUDY OF BOILER LOSSES, by A. P. Kratz, has been issued as Bulletin No. 78 of the Engineering Experiment Station of the University of Illinois. This bulletin presents a critical analysis of the data taken from a series of twenty-five trials made on a 500 horsepower Babcock and Wilcox boiler in the University heating plant. The heat balance has been subdivided so as to isolate and determine the amounts of the several losses chargeable to the boiler, furnace and setting. Complete forms for calculating a series of boiler trials are also given. Tests were made also upon some samples of weathered coal. No difficulty was experienced in burning this coal, but it was found that it had deteriorated during the weathering until it was about the same composition and grade as fresh Vermilion County screenings. Copies of Bulletin No. 78 may be obtained gratis upon application to C. R. Richards, acting director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

CORRESPONDENCE

Figuring Size of Cooling Coils.

EDITOR HEATING AND VENTILATING MAGAZINE:

I note in your May issue, in "The Consulting Engineer" Department, an answer to Question 44, which refers to the size of cooling coils. I think that "Consulting Engineer" must have made a mistake in his figuring, and he has carried the mistake all the way through to the end of the example. His mistake is so large that it cannot be a mistake in the printing. I fail to understand where he gets his factor of 3 lbs. of water per square foot of radiation, for all engineers have agreed that 0.3 lbs. per square foot of radiation in still air is ample, with the surrounding air at or about 70° F., and a great many tests have shown that 0.25 was about all that 1 sq. ft. of radiation would deliver under the above-named conditions. However, it may be that the question referred to a fan blast coil, although it does not say so. If this is the case, then I can readily see that he might get 3 lbs. per square foot of radiation.

I would figure that this 5,000 sq. ft. of direct radiation would furnish 0.3 x 5,000 = 1,500 lbs. of water per hour and this, multiplied by 40 = 60,000 B. T. U. This, divided by 252 = 238.1 sq. ft. of cooling coil.

The writer, however, would use 500 sq. ft. on this job, if it was put up to him, as this has been his practice in the past and it usually has been sufficient to cool the condensate to the required temperature before delivering to the sewer. This is 10% of the amount of radiation in the building, while "The Consulting Engineer" says that it ought to be 48%; that is, if his figures are correct and he has not been misquoted. But his final result shows that he has been quoted correctly.

I call attention to this error, or what appears to me to be an error, so that it may be corrected in order that any reader not familiar with this work will not be led to make a mistake in figuring that might lose him a contract.

A. J. PURCELL.

Little Rock, Ark.

ANSWER BY "CONSULTING ENGINEER."

Regarding the size of cooling coils, the 3 lbs. per square foot was arbitrarily assumed to illustrate the method of determining the result. The correspondent's method of figuring and assumption are entirely correct.

The correspondent brings up a point which has caused considerable trouble. It is bad policy to base condensation on the pounds per square foot condensed unless the amount has been previously determined for that particular case. It is also dangerous to take a percentage of the radiation for the cooling coil. Sometime ago we had a question regarding the estimation of boiler power for a steam and for a hot water heating system to do the same work. The boiler power required in the two cases was widely different. This was caused by basing the power on the square feet of radiation.

In estimating boiler power the writer always bases the estimate on the B. T. U. loss from the building and not on the radiation, as radiation is frequently added or omitted for various reasons and the resulting boiler power will be correspondingly off.

In the same manner, when estimating the heat requirements for indirect heating, the writer always uses the heat required to raise the desired quantity of air through the desired temperature range, rather than to base the boiler power on the amount of indirect surface.

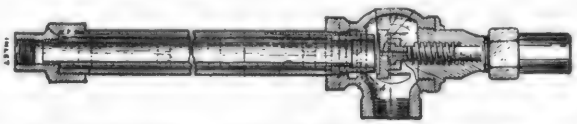
In the last part of the answer, it was intended to convey the idea that the cooling coils were seldom figured and generally old radiators that happened to be handy, were used.

Trade Literature.

POWELL ACCESSORIES, including Powell expansion joints for working pressures up to 125 lbs., Powell angle swivel coupling with expansion sleeve, Powell Swing joint, as well as the company's line of Union composite disc valves, and the new Powell "Irenew" valve for working pressures up to 150 lbs., are the subject of a booklet recently issued by the Wm. Powell Co., Cincinnati, O., manufacturers of these accessories, as well as of the well-known White Star valves. A copy of the booklet may be had for the asking.

THERMOGRADE SYSTEM OF STEAM HEATING in operation is illustrated in a clever card being sent out by the Consolidated Engineering Co., Chicago, Ill. By bending the edge of the card to and fro the pointer on the valve dial is moved from one position to another and at the same time the effect on the radiator is shown by varying degrees of shading, indicating a hot, half-hot and cold radiator. The card calls attention to the discovery of the basic principles for modulating the steam of a radiator made by Frederic Tudor in 1882. These are the principles incorporated in the Thermograde modulating valve. Reference is also made to the tests conducted by Prof. H. W. Spangles, formerly head of the engineering department of the University of Pennsylvania on a Thermograde modulation system of heating. Among other things a 34% fuel saving was shown. It is stated that all buildings at the university have since been Thermograde heated, and on April 22, 1915, the company received a contract for equipping three additional buildings. The company also markets the Kinealy air conditioning apparatus.

AND THEN CAME THE BARTON EXPANSION AUTOMATIC STEAM TRAP is the title of a Catalogue devoted to one of the latest types of steam trap, made by the Automatic Steam Trap & Specialty Co., Detroit, Mich. In addition to a full description of the device and its different applications, the catalogue is notable for the number of testimonial letters expressing the satisfaction of users. The Barton trap acts on the principle of the condensed water causing a lowered temperature which contracts the inner sleeve and automatically opens the trap for the water to escape. When the temperature is again raised by the incoming steam it closes the valve by expanding the sleeve. Another feature emphasized is that the trap provides a continuous flow that can be correctly metered to determine the exact amount of steam used in any plant. It is stated to be the only trap that will operate with both vacuum and gravity systems at all pressures. Size 3½x6 in. (standard). Pp. 16.



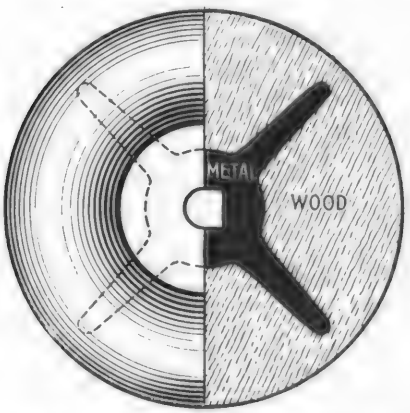
BARTON EXPANSION AUTOMATIC STEAM TRAP.

TYLER UNDERGROUND HEATING SYSTEMS, Pittsburgh, Pa., has published a new architects' and engineers' data sheet, which contains some sixty-one charts and tables relating to heating, as well as illustrations of the devices and construction features of the Tyler underground heating systems for central station heating work. The data sheet measures 30½ in. by 20 in.

J. C. HORNUNG, engineer, 111 West Monroe St., Chicago, Ill., has issued new bulletins (Bulletins 8, 9, 10 and 11) devoted, respectively, to the Hornung automatic pressure and temperature control valve, the Hornung automatic differential and temperature control valve, the Hornung central station special ex-

pansion joint and the Hornung B. C. condensation trap. The circulars are of uniform size, 6 x 9 in. standard, and in each case the data are concise and to the point. A table typical of those often found in the Hornung bulletins is reproduced herewith. It shows the amount of steam (vapor) required per square foot of radiation per season to main 70° F. inside at various annual outside temperatures.

"KANTSPLIT" VALVE WHEELS are featured in circular matter sent out by the Holton-Abbott Mfg. Co., West Somerville, Mass. This valve wheel is described as a strong metal wheel embedded in a wooden one. the spokes



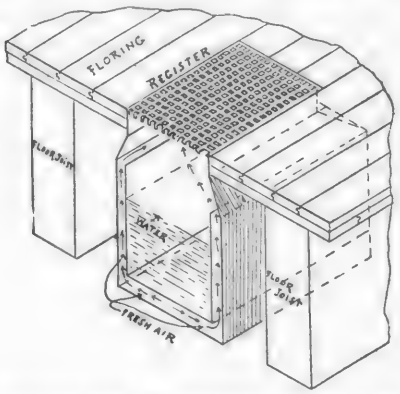
THE KANTSPLIT VALVE HANDLE.

of the former binding the fibers of the wood together, and preventing the wood from splitting. The parts are made immovable and irremovable by the process of manufacture, so that the wheel is complete in one piece with no loose plates.

NATIONAL TUBE COMPANY CATALOGUE J—1915, has just been issued. It contains 450 pages, printed in two, and in some places, three colors, embracing in detail the line of pipe fittings, valves and specialties manufactured at the Kewanee Works of the National Tube Company. It also shows in general the other products manufactured by this company. Some idea of the completeness of the catalogue may be gained from the fact that the index embraces approximately 1800 entries. On account of the size of the catalogue it is stated that the edition is limited, the circulation being confined to dealers and other large consumers. The catalogue supersedes the 1909 edition and is published by the National Tube Co., Pittsburgh, Pa.

FISHER POWER PLANT SPECIALTIES, manufactured by the Fisher Governor Co., Marshalltown, Ia., including the Fisher governors and regulating devices for pumps, Fisher reducing valves and pressure regulating devices, Fisher back pressure automatic exhaust and relief valves and other devices, are the subject of a new bulletin catalogue. A few pages at the beginning of the catalogue are devoted to a review of the inventions of William Fisher, the inventor of the governor that bears his name, and it is stated that there was no adequate method of controlling steam pumps previous to his invention. It is more than a third of a century since the first Fisher governor was given to the steam world. The bulletin is accompanied by a special circular featuring the Fisher noiseless back pressure valve, designed to operate in any pipe line position. Size of catalogue 6 x 9 in. (standard), pp. 96.

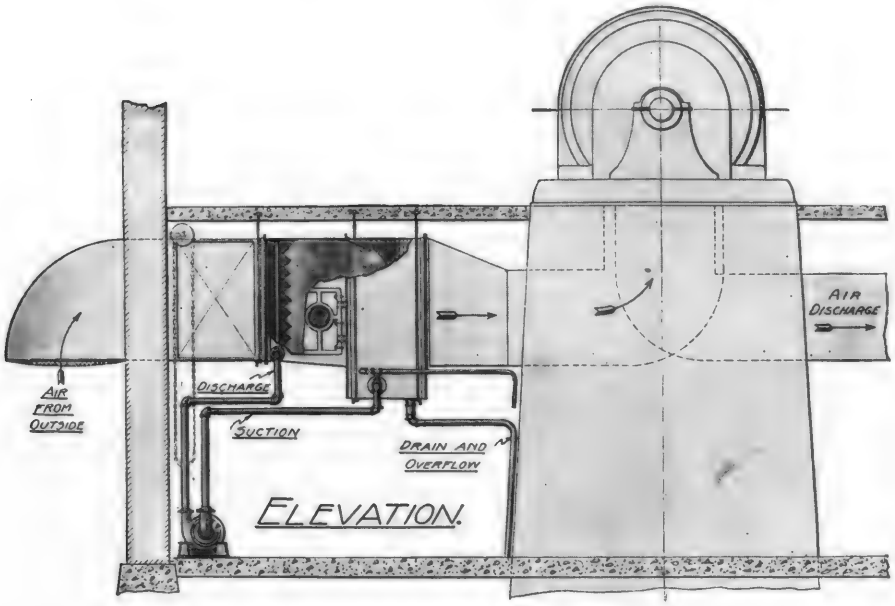
HUMIDITY IN OUR HOMES, featuring the Lockhart humidifying system, invented and patented by John T. Lockhart, Westmount, Quebec, is the subject of a circular outlining the system in detail. The general arrangement may be seen from the accompanying illustraton. The system includes water receptacles located at various points directly beneath the floor. These receptacles are connected by piping to a heater placed in the firepot of any make of furnace. Each receptacle has inlet and outlet openings, causing



SKETCH OF VAPORIZING TANK IN POSITION.

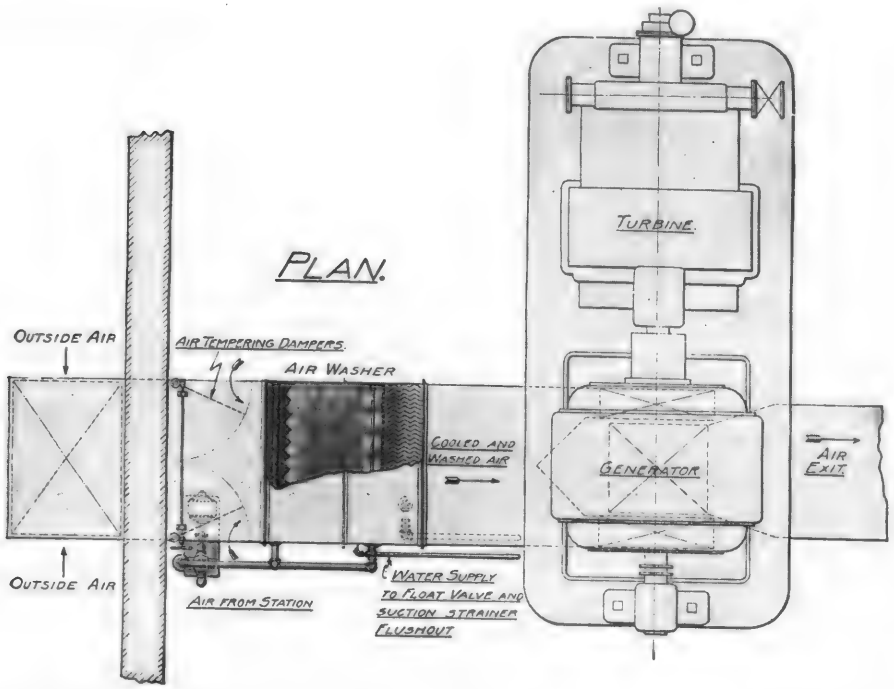
the water to circulate. The system is valved for draining when desired. All of the water receptacles, it will be noted, are made with an air space of 1½ in. at the bottom and ¾ in. at the two sides. The air is brought in from the outside by one pipe and distributed to each receptacle. After the incoming air is heated and moistened by the vapor from the receptacles, it passes up through the registers into the rooms.

PETERSON POWER PLANT OIL FILTER and accessory apparatus for central oiling systems is the subject of an elaborate catalogue pub-



lished by the Richardson-Phenix Co., Milwaukee, Wis. Size 8½x11 in. (standard). Pp. 32.

WASHING AND COOLING AIR FOR STEAM TURBINE GENERATORS is an application of the air washers of the Spray Engineering Co., Boston, Mass., which is described and illustrated in a recent catalogue issued by this company. The catalogue gives results of recent tests with Spray air washers, showing cooling results in this connection ranging from 11° F. to 19.25° F., depending on the time of year, but in every case resulting in cooling the air practically to the temperature shown by the wet bulb thermometer. Size 6x9 in. Pp. 8.



ELEVATION AND PLAN OF AIR-WASHER LAYOUT FOR TURBO-GENERATOR.

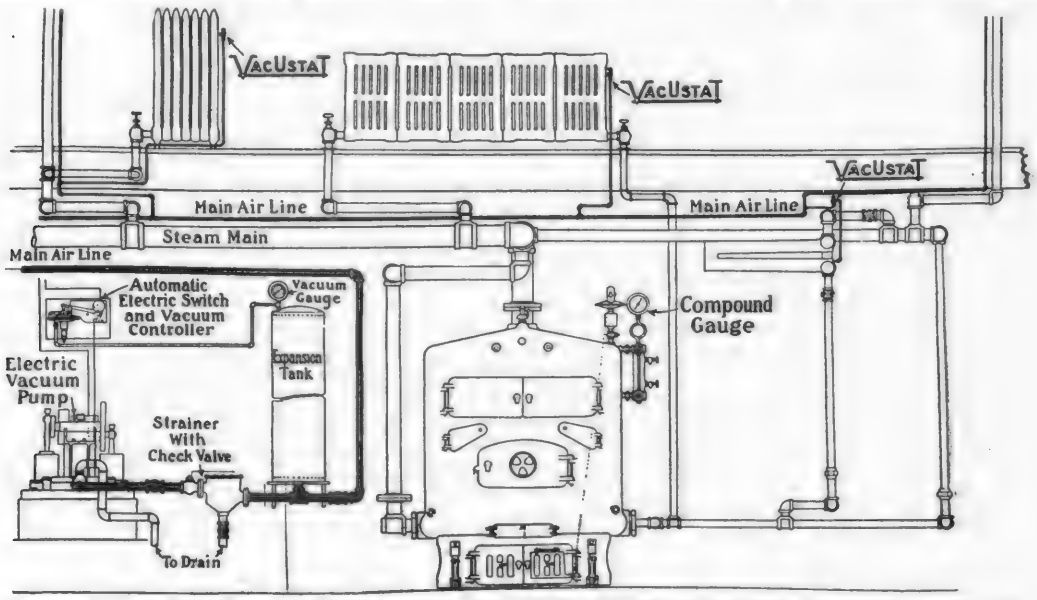
SYRACUSE PACKLESS RADIATOR VALVES, giving an interesting history written by Joseph F. Brightman, manager of the incorporation and growth of the Syracuse Faucet & Valve Co., of Syracuse, N. Y., and containing also numerous illustrations of buildings in which Syracuse packless radiator valves are installed, has lately been published by this company. In addition some remarkable letters from satisfied users are presented as evidence of the advantages of this line of valves. The fact that the company is a specialist, making one kind of valve is given as one of the principal reasons for the high development of the Syracuse packless, which is adaptable for vacuum, vapor, hot water, and single and double pipe systems of steam heating. Size 6 x 9 in. (standard). Pp. 24.

RELIABLE VACUUM AND VACU-VAPOR HEATING EQUIPMENT is the title of a catalogue that will be read with much interest by engineers generally, as well as by those more particularly interested in the devices discussed, which are used in the Reliable air line and return line vacuum and vacu-vapor heating systems, manufactured by the Bishop-Babcock-Becker Co., Cleveland, O. Every effort has been made to explain as clearly as possible the construction and function of the different appliances and their action is further illustrated in a series of typical layouts, one showing the air line electric vacuum heating equipment, one, the return line equipment and a third showing the vacu-vapor heating equipment. On other pages sectional half-tone views of the Reliable valves are shown, including the vacustat, vacu-trap, vacu-graduate packless radiator valves, one style of the latter being made with lever handle. There is also shown the Reliable return line electric vacuum pump, which is a recent addition to the company's line, with a maximum capacity of 2,000 sq. ft. of radiation. The catalogue concludes with complete suggestions for specifications covering the three styles of heating. Size 5x8 in. Pp. 96.

New Automatic Suction Ventilator.

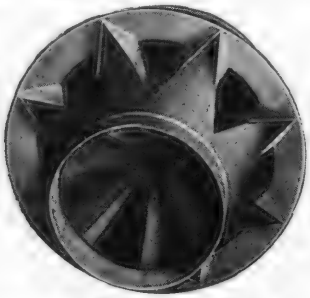
A type of automatic suction ventilator, described as efficient in service, architectural in design and having positively no down draft, has been placed on the market by the Century Ventilating Co., 424-426 East 23d Street, New York. It is known as the Gem and is illustrated herewith. One of the points made for this type is that it does not need a higher interior temperature in order to give results, but by

GEM AUTOMATIC SUCTION VENTILATOR.



METHOD OF INSTALLING RELIABLE AIR LINE HEATING SYSTEM, WITH A ONE OR TWO-PIPE STEAM PLANT.

reason of its powerful automatic suction, it will displace air from a building many degrees colder than the exterior atmosphere. The ventilator is made with eight wind conveyors terminating horizontally in a triangular form and leaving like triangular spaces for the passage of the foul air. The wind as it passes through the conveyors tends to form a vacuum in the triangular spaces between the conveyors

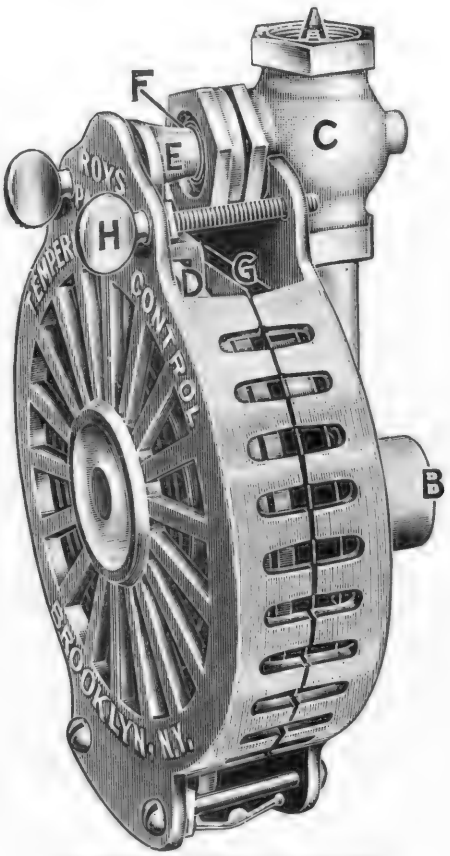


INTERIOR CONSTRUCTION OF WIND CONVEYORS IN GEM VENTILATOR.

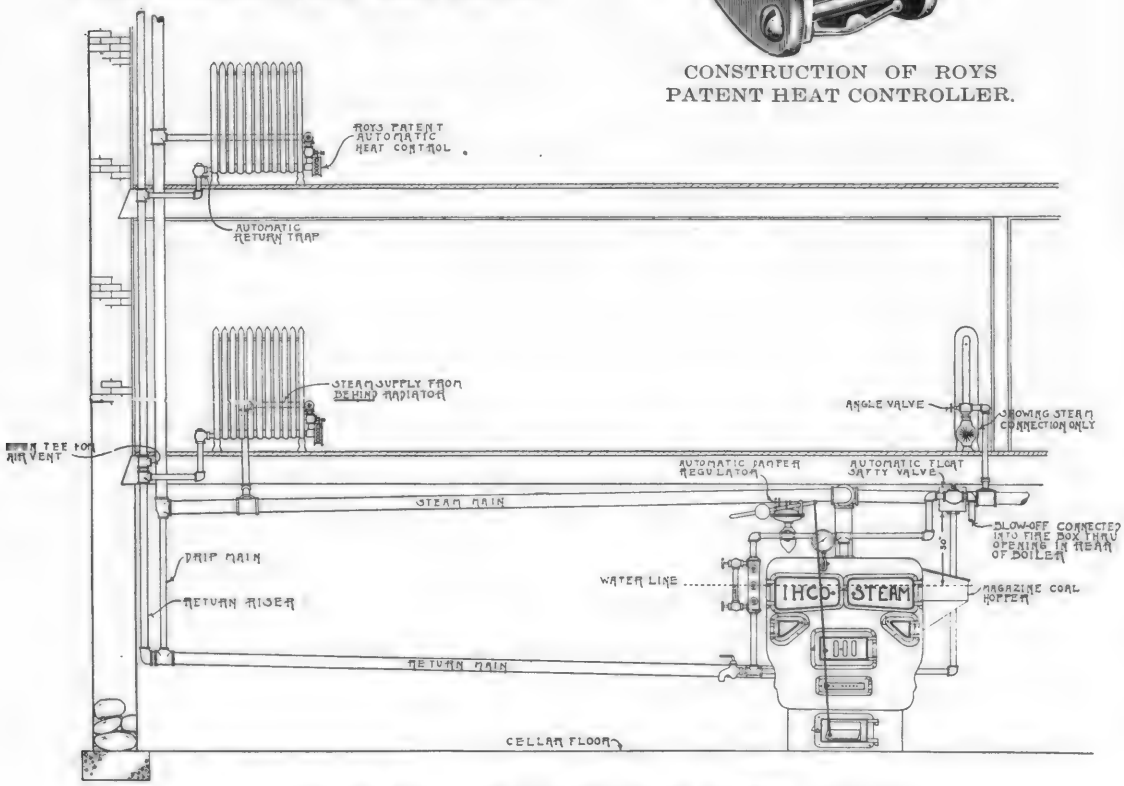
and thus produces an automatic suction. It is made in fifteen sizes, ranging from 8 to 72 in. in diameter.

New Principle in a Heat Controller.

A heat controller, which, when attached



CONSTRUCTION OF ROYS PATENT HEAT CONTROLLER.



— SECTION SHOWING AUTOMATIC HEAT CONTROL SYSTEM — WITH PIPING DETAILS

to a radiator, is designed to automatically open and close the steam supply valve to the radiator so as to maintain a steady, even temperature within one degree of any temperature at which it is set, has been brought out by the Roys Heat Control Co., 915 Gates Ave., Brooklyn, N. Y. As will be noted from the illustration, showing a typical layout with this system of control, the arrangement does away entirely with the air valve. Other features of the system include the use of Roys automatic return traps and an automatic safety valve. The use of a magazine feed boiler is also recommended with this system.

The construction of the heat controller will be seen from the accompanying illustration. A is the steam inlet to the controller. B is the steam inlet from the controller to the radiator. C is the valve part of the controller. D is a thermostat composed of two corrugated silver discs hermetically united, forming a hollow thermostat. This thermostat is filled with a pressure-exerting gas which acts in such a manner as to expand the thermostat sufficiently to close the steam inlet to the controller at a temperature of 72° F. At 68° it has contracted enough to release the pressure on the valve seat. A spring inside of the valve opens the seat, automatically permitting more steam to enter. E is a boss which presses against the spindle of the valve seat and closes the seat of the valve on pressure from the thermostat. F is a silver corrugated diaphragm which permits the opening and closing of the valve seat. G are non-conductive metal baffles which keep the radiant heat of the radiator from affecting the thermostat by providing spaces for air circulation. H are thumbscrews, which provide means of adjustment to any temperature. By tightening these thumbscrews a temperature as low as 60° F. can be maintained. By loosening the thumbscrews a temperature up to 80° F. can be obtained.

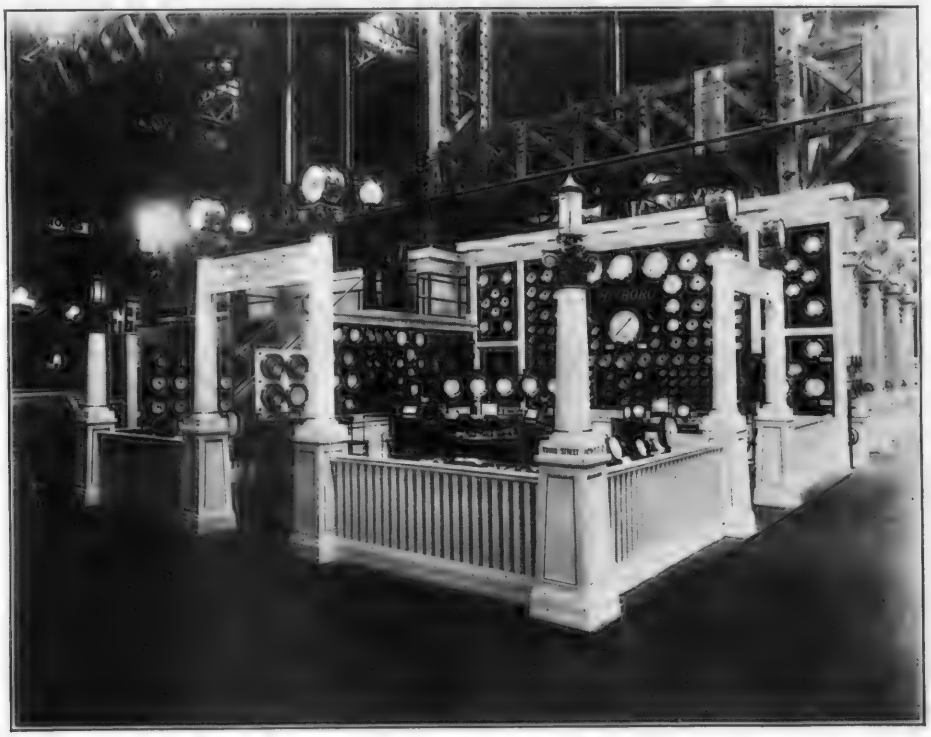


EXHIBIT OF THE FOXBORO COMPANY AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

Panama-Pacific International Exposition Exhibits.

2.—THE FOXBORO COMPANY.

A complete line of indicating and recording instruments for measuring pressure, temperature, speed and time, also automatic temperature controllers and orifice meters, is being shown by the Foxboro Co., of Foxboro, Mass., at the Panama-Pacific International Exposition.

In utilizing recording instrument cases, an attractive light has been designed for the

pillars at the entrances. At the rear of the booth there is a large mahogany panel, on which there are symmetrically arranged "Foxboro" recorders and thermographs, also 170 indicating gauges for pressure and vacuum for every purpose in all sizes from 2 in. to 24 in. in diameter. This is the largest assortment of gauges ever arranged on a single panel for display purposes.

A second attractive mahogany panel at the left side of booth has a display of indicating dial thermometers, round and square case counters, thermographs, recording gauges, recording hygrometers and liquid level recorders; also, an interesting display of the many bulbs, connections and capillary tubing used on this service.

An orifice meter, measuring flow of air, is shown in operation; this is one of the latest developments for accurately measuring the flow of gases and liquids. It is understood that an accuracy of within less than 1% is guaranteed.

At the center of the booth is arranged a frame on which there is an automatic temperature controller, also a recording thermometer, two liquid level recorders, a vacuum recording gauge and a gas pressure recording gauge in operation.

All types of recording gauges for any range, from full vacuum to 20,000 lbs. per square inch, and a very complete line of both indicating and recording thermometers for any range, from minus 60 to plus 800° F. are shown, together with a complete line of electric pyrometers, for any range up to 3,000/ F. or its equivalent.

A. F. Mundy, the company's Pacific Coast manager, assisted by C. E. Sullivan, direct from the works at Foxboro, as well as the company's gas engineer, D. M. Hill, have been active in placing the exhibit in position and the former will be present the entire period of the exposition.

William H. McKiever, New York, engineer and contractor for heating, ventilating and power plants, announces the removal of his offices to the Townsend Building, 1123 Broadway.

ADVERTISERS' INDEX

	Page
Alberger Heater Co	76
American District Steam Co	77
American Blower Co	71
American Radiator Co	Back Cover
Armstrong Mfg. Co	59
Bicalky Fan Co	12
Bishop-Babcock-Becker Co.	60
Bristol Co., The	Front Cover
Buffalo Forge Co	5
Carrier Air Conditioning Co	64
Central Station Steam Co	82
Century Ventilating Co	—
Connersville Blower Co	3
Consolidated Engineering Co	82
Davis Regulator Co., G. M	62
Detroit Lubricator Co	63
"District Heating"	73
Dunham Co., C. A	12
Foster Engineering Co	6
Globe Ventilator Co	Front Cover
Gurney Heater Mfg. Co	Front Cover
Hornung, J. C	8
Hutchison Vapor Heating Corporation	72
Ilg Electric Ventilating Co	4
Industrial Instrument Co	61
Jenkins Bros.	61
Johns-Manville Co., H. W	75
Johnson Service Co	68
Kernchen Co., The	10
Knowles Mushroom Ventilator Co.	Front Cover
Lavigne Mfg. Co	6
Lytton Mfg. Co	Inside Back Cover
Marsh Co., Jas. P	3
Michigan Pipe Co	Front Cover
Mouat-Squires Co.	82
Mueller Mfg. Co., H	7
Parker Supply Co	—
Patterson & Co., Frank	80
Powell Co., The Wm	81
Pressed Metal Radiator Co	9
Ric-Wil Underground Pipe Covering Co.	81
Ross Valve Co	Front Cover
Sarco Engineering Co	8
Scaife Sons Co., Wm. B	81
Sims Co., The	80
Spencer Turbine Cleaner Co	78
Standard Thermometer Co	76
Standard Wood Pipe Co	81
Sturtevant Co., B. F	67-69-70
Syracuse Faucet & Valve Co	7
Taylor Instrument Companies	74
United Vacuum Appliance Co	10
Webster & Co., Warren	65
Wells & Newton Co	65
Westinghouse Electric & Mfg. Co.	Inside Front Cover
Wyckoff & Sons Co., A	78
Zellweger & Sons, J	66

TRADE AND MISCELLANEOUS NOTES

Coming Events.

September 7-10, 1915.—Annual meeting of the American Public Health Association, at Rochester, N. Y. Secretary, Prof. S. M. Gunn, 755 Boylston Street, Boston, Mass.

September 16-18, 1915.—Mid - summer meeting of The American Society of Heating and Ventilating Engineers, at San Francisco, Cal. Headquarters at the Hotel Bellevue. Secretary, J. J. Blackmore, 29 West 39th Street, New York.

Deaths.

George E. Fenn, Boston, Mass., manufacturer of rotary ventilators under the name of the Fenn Ventilator Co., Boston, died at his home in Melrose May 28. His death was due to the accidental discharge of a revolver. Mr. Fenn was a native of Roxbury, where he was born in 1865. He has been engaged in the ventilator business for 25 years or since the death of his father, who founded the business.

Elmer Crawford, president and treasurer of the Crawford Publishing Co., Chicago, and formerly advertising manager for Domestic Engineering, of Chicago, died suddenly June 15, at the Hotel Sherman, in that city. He was 50 years old. His death was caused by heart failure. During Mr. Crawford's connection with Domestic Engineering, from 1899 to 1909, he formed a wide circle of acquaintances in the heating and plumbing trade. Since his connection with the Crawford Publishing Company, which publishes Mill Supplies, he was recognized as an influential figure in the mill, mine and machinery supply trade. At the time of his death he was editor-in-chief of Mill Supplies. Mr. Crawford was in seemingly good health at the recent convention of the National Pipe and Supplies Association, which was especially reported by him for Mill Supplies. He is survived by a widow.

John Sears McKenna, president of the William N. McKenna Co., heating, ventilating and plumbing contractors, Boston, Mass., died at the home of his father, in Roslindale, May 26, of pneumonia. Mr. McKenna was one of the youngest heating and plumbing contractors in the business, being but 25 years of age. His father, who is treasurer of the company, will continue the business.

Miscellaneous Notes.

Milwaukee, Wis.—A four-year contract has been signed by the steam fitters and helpers with the contractors by which the journeymen will receive $4.50 a day and the helpers $2.25 the first two years. The second two years they are to receive $4.75 and $2.50.

Bangor, Me.—A central heating plant for the Penobscot County court house and jail is under contemplation by the county commissioners. Under the present conditions, in order to heat the jail, it is necessary to carry a sufficient pressure of steam in the boilers under the court house to run a pump to return the condensation from the jail. It is planned to locate the new plant at the rear of the courthouse.

Genuine Armstrong Stocks and Dies

MALLEABLE HINGED PIPE VISES

PIPE CUTTERS

PIPE MACHINES, HAND OR POWER

The Tools of Constant Service

Manufactured by — Write for Catalog

THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Tacoma, Wash.—Felix & Co., Vancouver, B. C., has leased a building on the tideflats from Allen C. Mason in which to open a branch of the Vancouver company, dealing in sawdust and shavings collecting systems, ventilating systems, and induced draft apparatus. The company has recently secured a contract for the ventilation of the new Elks' clubhouse in Tacoma.

Chicago, Ill.—The body of George L. Richards, secretary of the Alamo Heater Co., of that city, who had been missing for a week, was found in Lake Michigan, near Fifty-ninth Street, June 4.

Chicago, Ill.—Judge Trude in the Night Court has found the Metropolitan elevated railways guilty of six violations of the Chicago ventilation ordinance, and the Chicago and Oak Park elevated railway guilty of two. The trials were the result of the first of a series of charges filed against the elevated railroad companies for violation of the ordinance, which requires not more than twelve parts of carbon dioxide in each 10,000 cu. ft. of air. The two witnesses, Charles Deibold, health bureau ventilation inspector, and W. O. Marti, assistant city chemist, testified that samples of air taken on elevated trains did not meet the requirements of the ordinance.

Omaha, Neb.—A community heating plant is to be built at the R. R. Evans home at 56th and Farnam Streets, which stands in the center of a new residence district about to be promoted by H. H. Harper & Co., of that city.

Springfield, Ill.—The State senate has passed the house bill appropriating $140,000 for the installation of a new power and heating plant for the State Capitol.

Eastern Supply Association, at its recent meeting in New York, took definite action on the matter of interest charges on overdue accounts by directing that the following letter be sent to the members of the association, to be filed for reference. The letter has the endorsement of the National Association of Credit Men:

"Yours of the ———— has been received, and we note your attitude in reference to interest charges on overdue accounts. In view of the very courteous manner in which you have presented your side of the case, we regret that we cannot see our way clear to agree to your position in the matter.

"We are, however, of the opinion that the terms constitute just as important and binding a part of any business transaction as the price of goods. A purchaser would very properly resent any attempt on the part of a seller to raise his price after an order had been placed, and by the same standard of integrity the purchaser would have no

This is the No. 1279 RELIABLE Air Line Electric Vacuum Pump.

When RELIABLE Vacuum Pumps arrive on the job they are ready to be installed, quickly and easily—no adjustments are necessary, as each pump is given a thorough, practical test at our factory. Because of the simple, durable construction and the dependable Automatic Electric Switch

RELIABLE Vacuum Pumps

operate smoothly and evenly without noise, and are most economical in current consumption. The operating cost is only one-third to one-fifth as much as for other vacuum pumps.

RELIABLE Heating Specialties—Electric and Hydraulic Vacuum Pumps, VacUstats, Vacu-Traps, Vacu-Graduate Packless Valves, "4 V" Valves, Vacu-Checks, etc., are standardized and staple, and carried in stock by most representative jobbers.

Write today for your copy of new RELIABLE Heating Equipment Catalog.
Ask for Booklet "K."

THE BISHOP - BABCOCK - BECKER CO.

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New York, Chicago, Cincinnati, St. Louis, St. Paul
Milwaukee, San Francisco

right to take advantage of any more liberal terms of credit than those stipulated by the seller in his quotation.

"We are fully aware that there is a great deal of laxity prevalent in commercial transactions in this matter of cash discounts, and interest on deferred payments, but there is, we believe, an increasing tendency to correct this evil, and the National Association of Credit Men has been a great factor in arousing business conscience along this line.

"Mose manufacturing concerns find it necessary at times to negotiate bank loans to tide them over dull periods, and, of course, are obliged to pay the regular rate of interest for such accommodation. It is not fair or just, therefore, that their customers should take advantage of extended credit, beyond the terms stipulated, unless they, too, pay the same rate of interest for such privilege.

"We trust that you will not fail to understand that our position in the matter is based upon our convictions of justice and equity, and not upon a disposition to be arbitrary and exacting. It certainly is not fair to those of our customers who adhere strictly to our terms, to allow others an additional thirty or sixty days, unless they pay for the privilege. That would be placing a premium on delinquency.

"Feeling that you would not expect us to show any favoritism in this case, by deviating from our established rule in such matters, we await your remittance."

Sioux City, Ia.—M. J. Orr, of the Orr & Graves Co., heating and plumbing contractors, who was charged in the United States Court with perjury in connection with the conspiracy trial in Des Moines, Ia., has received notice that the charge against him has been dismissed upon recommendation of the Department of Justice.

New York—The size of the new Equitable Building at 120 Broadway, may be appreciated from the fact that the coal requirements are estimated at 15,000 tons per year. The boilers have a capacity of 3,200 H. P.

1915 United States Schedule of Flanged Fittings and Flanges, which was adopted March 20, 1914, by a joint committee of the National Association of Master Steam and Hot Water Fitters, The American Society of Mechanical Engineers and the Committee of Manufacturers on Standardization of Fittings and Flanges, has been published in chart form, measuring 35 x 24 in., and may be obtained by addressing the National Association of Master Steam and Hot Water Fitters, at 260 West Broadway, New York. The price of the chart is $1.00.

Providence, R. I.—The new central heating plant, to be erected at the State Institutions at Howard, for which bids were to be opened June 17, will furnish the electric lighting and power for all the institutions in Cranston, but in the beginning will heat only the State Hospital and State Farm groups of buildings. Later, additional equipment will be installed which will provide for

Jenkins Bros. Hose End Valves

Particularly adapted to fire protection service because they are fitted with Jenkins Bros. Discs of soft flexible rubber composition, forming seat and making the valves absolutely tight under cold water pressures. The discs never stick nor corrode, and valves are at all times ready for instant service. Various styles. Write for catalogue No. 20.

JENKINS BROS.

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SPECIFY FOXBORO TRADE MARK THERMOMETERS

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San Francisco, Cal., Palace of Machinery, Corner 3rd St. and Avenue C2

THE FOXBORO COMPANY Succeeding The Industrial Instrument Co.

New York Chicago FOXBORO, MASS., U. S. A. San Francisco St. Louis

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

the heating of the other buildings. At the present time there are five heating plants at the institutions, but the new plant will do away with most of these.

Central Heating Notes.

Los Angeles, Cal.—The bond issue of $6,500,000 which was voted for construction purposes will be devoted to the construction of a lighting and heating plant for Los Angeles. An attempt to enjoin the city from selling the bonds was upset by the superior court and the supreme court has now affirmed the judgment of the lower tribunal.

Cedar Falls, Ia.—Heating the high school and new gymnasium with exhaust steam from the municipal light and water plant and the disposal of the old boilers at the school which was the proposition discussed at a recent conference of school board members and city officials, has been rejected. It was held that within a short time the municipal plant would be forced to supply live steam for the purpose, as the major portion of the exhaust steam is already utilized. The heating plant in the school building accordingly will have to be enlarged.

La Salle, Ill.—The Marquette Heating Company has commenced work on the steam heating system in La Salle which will carry steam for heating purposes from the Wilson Building across the street, to a number of buildings. Other pipes are to be laid from the Lucey Building to the building now occupied by the Matt Pove Clothing Co.

Spokane, Wash.—The Merchants' Central Heating Company, organized by H. A. Flood, president of the Trustee Company, H. B. Ferris and R. J. Danson, has filed articles of incorporation, providing for a capital stock of $1,000,000, divided into $500,000 common and $500,000 preferred. The company will operate the steam heating system planned by the Trustee Company, a part of which is already installed.

Centralia, Wash.—The Centralia (Wash.) commission has entered into a contract with H. G. Fleischhauer, formerly manager of the Washington-Oregon Corporation, for the furnishing of electric current for heating, lighting and power purposes. The contract provides that the erection of a new steam plant must be started not later than August 1 and completed by October 1.

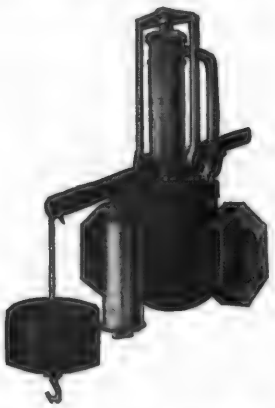
United States Light & Heating Co., Chicago, Ill., which has been undergoing reorganization, will again be in operation, it is expected, within a short time. Opportunity for participation by stockholders in the reorganized company was extended to June 1.

Des Moines, Ia.—The city council has agreed on details of a franchise which will

DAVIS VALVES

for the

Automatic Regulation of Pressure



Automatic Valve Specialties play an important part in the operation of most every high pressure steam plant. They are installed to perform certain functions and their failure quite often means interruptions, delays and expense.

For nearly forty years Davis Valves have been held in high esteem by men of experience who specify, install and use valve specialties.

We make—

Pressure Regulators
Balanced Valve
Float Valve
Steam Trap
Back Pressure Valve
Exhaust Relief Valves
Stop and Check Valves
Pump Governor
Condensation Receiver
Damper Regulator
Vacuum Pump Governor
Radiator Air Valves

When you are again in the market, try Davis Valves. Their efficiency will please you.

G. M. Davis Regulator Company

436 Milwaukee Ave., Chicago

Efficient Radiator Valves for Modern Buildings

Where *"Genuine Detroit Packless Radiator Valves"* are included in the specifications, it means economy and permanent satisfaction for the building owner.

In ordinary valves of the packed type the only protection against leaking is some loose asbestos packing or oil soaked wicking wound around the stem and held by an ordinary packing nut.

Sooner or later this packing wears out—the valves leak around the stem resulting in damaged floors and ceilings, loose plaster, spoiled rugs, furnishings, etc.

Detroit Packless Radiator Valves

are sure protection against such troubles on all kinds of steam heating systems. They are absolutely tight and always stay tight. Their design and construction are positive insurance against the annoyance and expense due to leaky radiator valves.

And the building owner and manager appreciate their installation because they never need repacking—because their first cost is the whole cost—and because there is no occasion for having a man spend most of his time keeping them in condition.

In addition to their non-leaking feature, the Detroit Packless Valves have a most pleasing appearance and are finished in a manner to harmonize with the most beautiful surroundings.

Booklet V-46, giving complete information on Radiator Valves, will be gladly sent on request.

"A Radiator Valve That Can't Leak"

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO, CANADA.

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Architects, D. H. Burnham & Co., Chicago
Heating Contractors, Phillips, Getchow Co., Chicago

be granted to the Des Moines Electric Company to operate a heating plant in the city for a period of 25 years. The proposition will be submitted to the people at a special election. The company expects to spend $300,000 this year in constructing a plant and in making additional improvements in the two succeeding years which will make the total expenditure $600,000. The agreement was reached as the result of a compromise among the company's attorney and manager and the council. The chief point on which the council and the company disagreed was the return that should be allowed the company after the first three years or the initial period. The company held out for a reasonable return which should be specified at 8 per cent. for fifteen years following the initial period. The council consented to such a return for ten years. Mayor Hanna objected to allowing discounts on bond sales as a part of the investment which was compromised by the insertion of a provision which in substance is as follows:

"That whenever the company shall desire to make extensions costing more than $5,000 in any one year, it shall submit to the council its proposed plan and the estimated cost and shall not proceed until the council's approval is obtained."

The mayor also succeeded in securing the insertion of a clause for the writing off of discounts out of the returns within a reasonable time.

The salient features of the franchise follow:

Franchise to run for twenty-five years.

Company shall serve as much of that territory embracing West Second Street on the east, Mulberry Street and Court Avenue on the south, West Ninth Street on the west and Grand Avenue on the north as possible the first year; the rest by October 1, 1916, with provisions for extension into East Des Moines and other territory within physical limits.

Council retains right to order extensions.

Initial rates for first three years fixed as follows: Eighty cents per 1,000 lbs. of steam used for first 20,000 lbs. or less consumed in any one month; 70 cents for next 20,000 lbs.; 60 cents for next 60,000 lbs., and 50 cents for the excess over 100,000 lbs., rates to be subject to a discount of 5 per cent. if paid in fifteen days.

Books of company shall be open to inspection of council at any time and shall be kept in Des Moines. Council may if it desires cause books to be audited once a year, expense to be borne by company. Company shall furnish a report or financial statement

Ninety In the Shade

Do you feel like doing much work under this condition?

Well—it isn't necessary. You can install

Carrier Humidifiers

and cool the air to the outside wet-bulb temperature—or an average cooling of about 15° F.

Don't you feel that you owe it to yourself—and your clients—to investigate?

A card will bring our catalog 13-36, or our engineer.

CARRIER AIR CONDITIONING COMPANY OF AMERICA

39 Cortlandt Street, New York City

Boston **Philadelphia**
Buffalo **Chicago**

The Webster System of Automatic Humidity Control

is readily applied to the various types of

WEBSTER AIR WASHERS

It is perfect in principle and accurate in operation.

It possesses features that make it both practical and simple, among which may be mentioned:

1. Separate control, by ordinary thermostats, of the average dry and wet-bulb temperatures of air leaving the Air Washer.
2. Independent of unequal air and spray distribution and temperature, ordinarily causing unequal humidification, supersaturation, inaccurate results, etc.
3. Quick response—the chief controlling thermostat subject to water, a medium with four times the specific heat of air.
4. Inherently safe against over humidification.

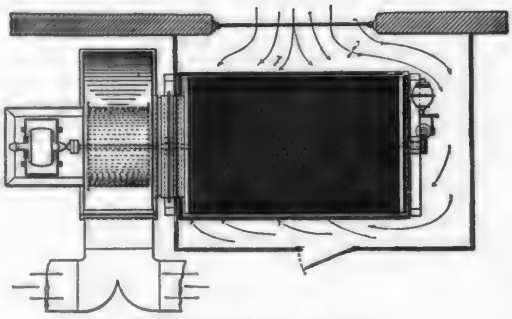
Send for catalogue "C"— 88 pages of valuable information
Consult us regarding Air Conditioning Apparatus for any purpose

WARREN WEBSTER & COMPANY, CAMDEN, N. J.

Established 1888 **Branches in Principal Cities**

KINGWELTON TALKS No. 6

The arrows show how the air is taken through the mesh so that there is no recirculation of muddy water through the incoming air.



Patented August 13, 1912
Plan View

The mesh surrounding the drum carries the impurities to the water bath, the washed and purified air being drawn directly from the drum.

A SUBSTANTIAL TEST
OF THE
KINGWELTON ROTARY AIR PURIFIER

A substantial test was made at the Pennsylvania Railroad Station, Pittsburgh, Pa., by the Railroad Company, where the local air is heavily charged with carbon from coal. The Kingwelton Rotary Air Purifier removed 99% of the impurities, depositing the carbon in the bottom of the tank for removal.

This apparatus is manufactured at our own works, in sizes to suit conditions.

Plans furnished for ventilating plants, with air purifier combined. Cost of operating apparatus after installation 9/10 less.

Write for descriptive circular.

WELLS & NEWTON CO., Ave. B and 17th St., New York

to council once each year, showing income, expenditures and investment.

Construction work by company shall not go further than to bring pipes into premises.

City retains option to purchase plant, if, at a time not less than twelve months before the expiration of the term of the franchise, a new one has not been secured by company. Price which city shall pay shall be the actual investment.

Company shall furnish an indemnity bond of $25,000 as guaranty that it will proceed with construction and equipment of heating plant.

The provision allowing the company a return of 8 per cent. on its investment follows:

"In recognition of the fact that the enterprise contemplated by this ordinance is a new one, more or less hazardous, and in consideration of the limitations and restrictions upon investment as herein defined, it is agreed that for a period of ten years following the initial period above fixed, 8 per cent. per annum shall be regarded as a reasonable return upon investment.

Investment is defined in the ordinance as follows:

Actual cost of organization, engineering, installation, obtaining of initial business, etc.

Discounts of financing expenses until same are written off out of income and losses, if any, until such time as income is sufficient to pay a reasonable return and write off such losses, provided, however, that no losses shall be allowed for initial period of three years unless the returns for entire three years show a loss.

Cost of construction, equipment, improvements, etc.

Extraordinary repairs and renewals.

Manufacturers' Notes.

Phelps Bros. Co., New York, announces the removal of its offices to 660 Woolworth Building, at 233 Broadway. The company's stock will continue to be carried at 210 Water Street.

William H. Page Boiler Co., Boston, Mass., has moved its offices to 100 High Street, adjoining its former quarters.

Monitor Bi-Loop Radiator Co., Lancaster, Pa., has purchased the business of the Monitor Steam Generator Mfg. Co., of Lancaster. It will continue the manufacture of the Monitor steam coil boilers and Monitor bi-loop radiators at its new plant in Lancaster.

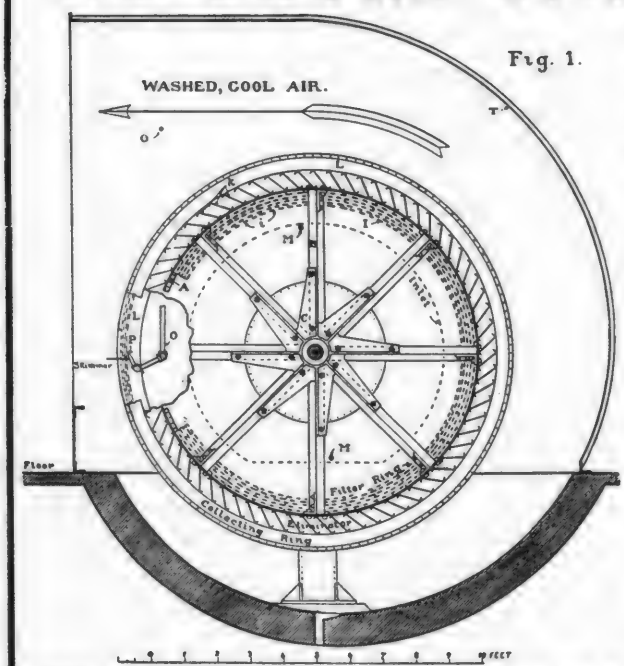
Lord & Burnham Co., Irvington, N. Y., is building a new $10,000 plant at St. Catharines, Ont., Canada, which will be devoted to the manufacture of greenhouse heating systems.

NO EXTRA SPACE NEEDED

for the air washer when you install a

ZELLWEGER AIR WASHING AND COOLING FAN

Fig. 1.



Zellweger Air Washing and Cooling Fan (Patented) in operation showing distributing and sprinkling pipes, water-spreaders and sprays.

1. Requires only as much space as an ordinary centrifugal fan of equal capacity.
2. Can be installed in suitable units in any part of a building.
3. Blows more air than a standard centrifugal fan.
4. Furnishes more air for equal power than older forms of air washer with any kind of fan.
5. Purifies and cools air more than earlier forms of air washers.
6. Self-cleaning.
7. Four apparati combined in one—blower, purifier, eliminator, circulator.
8. Can be applied to any centrifugal fan.
9. Perfects warm air heating systems and enlarges them into cooling systems.

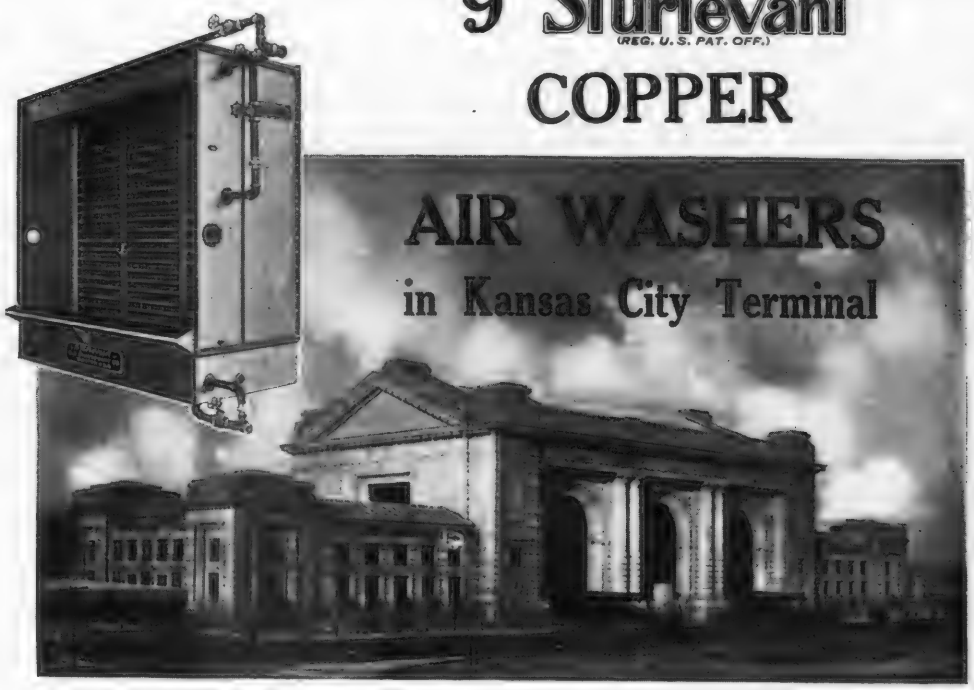
OUR CATALOGUE GIVES FULL DETAILS

J. ZELLWEGER & SONS

1900 Adelaide Avenue

St. Louis, Missouri

9 Sturtevant (REG. U. S. PAT. OFF.) COPPER AIR WASHERS in Kansas City Terminal



The air washers in the Kansas City Union Terminal have a combined air capacity of 301,000 cu. ft. per minute. There are two units of capacity 45,000 CFM; three units, 38,000 CFM; two units, 33,000 CFM; one unit, 24,000 CFM; and one unit 14,000 CFM.

All the air washers were guaranteed to humidify to 95% saturation with air leaving the pre-heater at 45°. The required air cleansing efficiency was 98½%.

The air washers have glass doors and observation window, and water-proof electric lights, and they are supplied by motor-driven pumps with water-cooled bearing. They operate in connection with Sturtevant Multivane Fans, of which there are 26 in the building.

Let us send you a catalogue describing the Sturtevant Air Washer

B. F. Sturtevant Company, Hyde Park BOSTON, MASS.

AND ALL PRINCIPAL CITIES OF THE WORLD

Federal Radiator Co., New Castle, Pa., which was recently incorporated with a capital stock of $600,000, has purchased the plant of the Penn Motor Co., at New Castle, in addition to a large plot of land adjoining, to accommodate additional buildings. The new company will manufacture steam and hot water boilers and radiators and will employ 400 men. Among the principals are Parker H. Cunningham and David Jameson of New Castle, C. F. Morrow, F. M. Mechling and G. C. Blackmore of Pittsburgh.

Lavigne Mfg. Co., Detroit, Mich., announces the removal of its Eastern offices to the Columbia Trust Company Building, at 358 Broadway, New York. H. R. Watson is the company's sales manager.

Walker & Pratt Mfg. Co., Boston, Mass., announces the retirement of John A. Fish as manager of the company's boiler department. Mr. Fish has held this position for fourteen years and was previously for fifteen years with the Gurney Heater Mfg. Co.

Hoffman Specialty Co., Chicago, has opened a New York office at 101 Park Avenue, with E. S. Storm in charge.

American Blower Co., Detroit, Mich., has opened a branch office in Columbus, Ohio, in the Harrison Building. L. E. Eisensmith, formerly connected with the company's Pittsburgh branch, is in charge.

Frank L. Patterson & Co., New York, reports that hot water for the new buildings being built at the Pennsylvania State Tuberculosis Sanitarium at Cresson, Pa., will be furnished by seven Patterson hot water heaters. This company also reports a good demand for various types of Patterson hot water heaters and converters, the recent installations including those in the City Hall, Philadelphia; St. Catherine's Hospital, Omaha, Neb.; Cornell University, Ithaca, N. Y.; Crown Building, Cleveland, Ohio; Citizens' National Bank Building, Evansville, Ind.; St. Michael's College, Hillyard, Wash.; Evander Childs High School, New York; Central School, Lincoln, Ill.; The Faxton Hospital, Utica, N. Y., and the Barner Hospital, Paterson, N. J.

E. C. Molby, New York, announces that after a successful season's experience with the Molby down-draft boiler for steam and hot water heating, his business has been incorporated under the name of the Molby Boiler Co., Inc., to take care of the increased demand for this boiler. The new company will have an amply equipped modern foundry, with facilities for manufacturing these boilers in quantities for prompt shipment.

Johnson Sylphon Valve

in which the RUBBER diaphragm is replaced by the METAL SYLPHON BELLOWS, which will not vulcanize, crack and leak, reducing the repairs to a minimum and increasing the efficiency and desirability of the Johnson System of Automatic Temperature Regulation.

Write for Booklet.

Johnson Service Company

MILWAUKEE, WISCONSIN

NOTICE—We are the owners of Patent No. 924,235 relating to the automatic control of humidity. Infringers and unlicensed users will be prosecuted.

Fans installed in the Cincinnati General Hospital

Architects' drawing of Cincinnati General Hospital.

33 Sturtevant Fans in Cincinnati General Hospital

(REG. U. S. PAT. OFF.)

The new General Hospital at Cincinnati has 33 Sturtevant Fans with a combined air capacity of more than a quarter of a million cu. ft. per minute. They vary in size from Sturtevant Ready-to-Run Portable Ventilating Sets delivering 500 CFM to No. 8 Multivane Fans delivering 13,000 CFM. A Ready-to-Run set is shown below.

All fans are direct-connected to Sturtevant direct current electric motors. The largest motor is of nominal size, 10 horsepower.

Our engineers will be glad to co-operate with heating and ventilating engineers and to submit plans and specifications.

B. F. Sturtevant Company

Hyde Park **Boston, Mass.**

AND ALL PRINCIPAL CITIES OF THE WORLD

Wrot Iron Heating Co., Des Moines, Ia., manufacturers of wrought iron warm air furnaces, has moved into its new building at 1015-1055 Murphy Street. The building involves an investment of $25,000, and is the first of a group of buildings to be erected by the company. New additions are planned for an annual output of 10,000 furnaces. Donald B. Howard is general manager.

Wrot Iron Heater Co., Des Moines, Ia., announces the appointment of Harry R. Snyder as busines manager of the Wrot Iron Heater Co. Mr. Snyder for 20 years previously was with the Williamson Heater Co., of Cincinnati.

New Firms and Business Changes.

Tayler & Waltz, consulting mechanical engineers, Detroit, Mich., have moved to new quarters in the Kresge Building on Adams Avenue West. The company specializes in heating, ventilating and drying work and in the design and equipment of power plants.

Clemens & Brakesma, Grand Rapids, Mich., have taken over the heating and plumbing business of A. F. Vollette & Co., in that city.

Business Changes.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until July 26, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Webb City, Mo. One story and basement, 4,500 sq. ft. ground area.

Until July 29, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Quitman, Ga. One story, basement and mezzanine, 3,650 sq. ft. ground area.

Until July 30, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office at Albion, Mich.

Business Troubles.

Spokane, Wash.—The Inland Heating & Plumbing Co., has failed with liabilities of $13,959. The company's assets are $2,485.

New Incorporations.

Sanitary Heating & Plumbing Co., Ltd., Bay City, Mich., capital $1,200.

Ventilouvre Co., Inc., New York, capital $25,000, to manufacture ventilators and transoms. Incorporators: C. M. Wills, W. D. Potosky, 30 East 42nd Street; and F. L. Guggenheimer, 115 Broadway, New York.

Martin Bros., Lancaster, Pa., capital $10,000, to conduct a heating and plumbing contracting business. Incorporators: J. A., E. J. and M. Martin, all of Lancaster.

Independent Heater Co., Steelton, Pa., capital $5,000, to manufacture hot water heaters. Incorporators: H. A. Stock, Millersburg, Pa.; C. M. Genther, Middletown, Pa., and F. E. Bailey, Steelton, Pa.

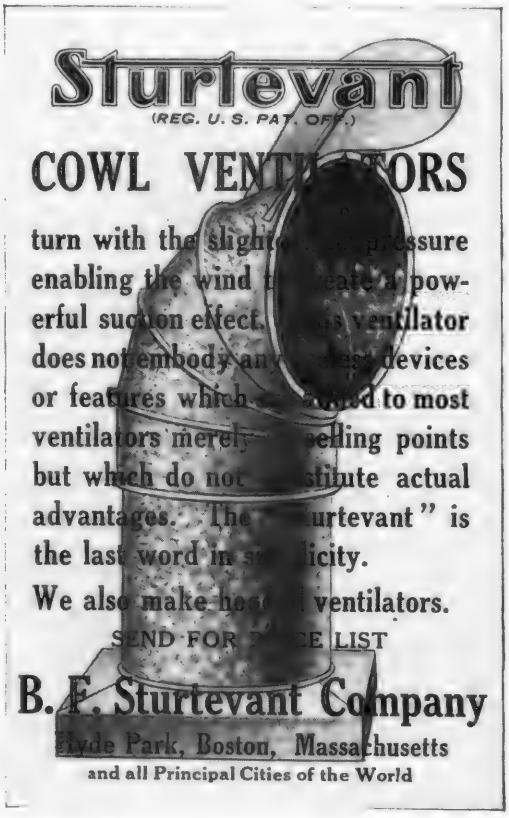
Vulcan Mfg. Co, Pittsburgh, Pa, capital $5,000, to manufacture water heaters, steam heaters, boilers and burners. Among the principals are Robert A. Throop, 1808 Pike Street, Pittsburgh; W. J. Craig, Ingram, Pa., and Pier Dannals, Crafton, Pa.

Carl P. Peterson Co., Malden, Mass., capital $5,000, to conduct a general heating, plumbing and gas fitting business. Incorporators: Carl P. Peterson, A. S. Smith and M. A. Murrican.

Plumbing Service Co., Boston, Mass., capital $10,000, to conduct a heating and plumbing business. Incorporators: W. S. Smith, Robert W. Hill and F. L. Tibbetts.

F. O. A. Weber Plumbing, Heating, Ventilating & Construction Co., Cleveland, O., capital $5,000. Incorporators: H. W. Kleinknecht, F. O. A. Weber, F. J. Weber, A. C. Weber and B. Schlund.

Tay-Pike Co., Bakersfield, Cal., to deal in heating and plumbing supplies. Incorporators: E. H. Kinney, F. J. Baker, P. E. Mack, and P. M. Pike, all formerly with the George H. Tay Co., of San Francisco.



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TRADE MARK.

Heating—Ventilating and Cooling Systems

are being specified by Architects—Engineers and Contractors for Office—Educational—Public and Industrial Buildings **because** of "Sirocco's" **power saving—space saving** and **low cost of maintenance.**

One of our most prominent Architects specified "Sirocco" for 36 buildings of his design, not because **"Sirocco"** was cheaper in first cost but **because** "Sirocco" was **less expensive** in the **long run.**

You may have our bulletins in your file merely by making a request. Our Engineering Department will gladly co-operate with you at any time.

AMERICAN BLOWER COMPANY

DETROIT. MICHIGAN. U.S.A.

Canadian Sirocco Co. Limited, Windsor, Ont., Manufacturers for Canada.

Mybro Heating & Mfg. Co., Canal Dover, O., capital $60,000, to manufacture heating specialties. Incorporators: L. R. Hildreth, H. W. Edwards, P. S. Larkby, D. B. Myers and W. L. Larkby.

Inferno Mfg. Co., Philadelphia, Pa., capital $100,000, to manufacture gas heaters and water heaters.

Portland Practical Heating Co., Portland, Ore., capital 5,000. Incorporators: Harry H. Pearce, Louis F. Lundburg and R. Steinberg.

Herbert Coombs Power Co., Peabody, Mass., incorporated to conduct a heating and plumbing business. Incorporators: P. J. Herbert, president; Ernest W. Coombs, treasurer, and J. W. Power.

Kopatz Plumbing & Heating Co., Detroit, Mich., capital $2,000, to conduct a heating and plumbing business. The principals are Allen Kopatz and Jacob Silenkow.

Molby Boiler Co., Inc., 39-41 Cortlandt Street, New York, to take over the business of E. C. Molby. Mr. Molby remains at the head of the new company.

New Contracts.

R. D. Black & Co., Duluth, Minn., heating and plumbing Union Building, at Fourth Street and First Avenue West.

Everts & Overdeer, Lancaster, Pa., heating and plumbing new west wing of the sanatorium at that place. The new wing will accommodate 250 children.

Smith & Wells, Springfield, Mo., heating and ventilating new building at College Street and Public Square for the C. H. Heer Dry Goods Co., for $9,000.

J. L. Simmons Co., Chicago, Ill., constructing new heating plant on the University campus at Bloomington, for $29,252.

Kininson Bros., Dallas, Texas, heating Hill County Court House at Hillsboro, Tex., for $2,691. Hill Bros., Waco, submitted a bid of $2,750.

Ruhaak-Lackman Co., Pekin, Ill., heating, ventilating and plumbing new high school building at Peoria.

Columbus Heating & Ventilating Co., Columbus, O., remodeling the heating plants of five school buildings in Findlay, for $43,800.

J. M. Dougherty, Ottawa, Ill., reconstructing the heating and ventilating plant at the Jefferson School, at La Salle, for $5,615. Other bidders were: Brady & Co., Chicago, $5,686; W. A. Pope, Chicago, $5,789, and Prafcke & Wells, Ottawa, $6,-156. A Kewanee boiler will be installed.

Bay State Construction & Supply Co., Boston, Mass., refrigerating plant for the pathological department of the Boston City Hospital, for $4,897. The Walworth English Flett Co., Boston, submitted a bid of $5,347.

American Warming & Ventilating Co., Cleveland, O., heating and ventilating the Chalmers Avenue and Madison schools for $9,094 and $15,000, respectively.

Richards & Chard, Stamford, Conn., heating and ventilating Federal Hill School at Bristol, for $8,000.

J. F. Shea, Portland, Ore., heating and ventilating Kennedy School in Portland, for $9,285.

Kendall Heating Co., Portland, Ore., heating and ventilating Stettler Box Co.'s $45,000 warehouse.

Cass-Smurr-Dameral Co., Los Angeles, Cal., heating and ventilating new Whittier grammar school, in Los Angeles, for $2,442.

Hoagland-Lakin Electrical and Engineering Co., Los Angeles, Cal., heating and ventilating new $45,000 Hyde Park School, for $9,294. The plumbing contract went to H. J. Crawford, Los Angeles, at his bid of $4,140.

Pacific Fire Extinguisher Co., San Francisco, Cal., heating and ventilating Third Church of Christ, Scientist, for $4,595.

Ben Olson Co., Tacoma, Wash., heating and ventilating new school building at Falls City, Wash., for $2,300.

Samuel A. Esswein Heating & Plumbing Co., Columbus, O., remodeling heating and plumbing systems in the Eleventh Ave-

ARE YOU EVER CALLED

on to make an estimate for VAPOR HEATING on short notice and have to write for layout and cost of specialties?
THE HUTCHISON SYSTEM is so easy to estimate on and so simple to install that an elaborate layout is unnecessary. We quote you prices and discount so that you have no difficulty in arriving at costs immediately. NO ROYALTIES CHARGED. Write for copy of the "HUTCHISON FITTER."

HUTCHISON VAPOR HEATING CORPORATION
WOODWARD BUILDING, WASHINGTON, D. C.

District Heating

A Full and Practical Treatise on Central Station Heating

by

S. MORGAN BUSHNELL

Past President, National District Heating Association; Member American Society of Heating and Ventilating Engineers; Member American Institute of Electrical Engineers

and

FRED. B. ORR

Commercial Engineer, Illinois Maintenance Co.

This book not only imparts a general knowledge of District Heating to those who wish to study the subject, but is also designed to promote the interests of District Heating companies. For this purpose various points on economical operation are suggested, as illustrated in the methods practiced by companies which have made a success in this line of work. Comparative data are also presented indicating the prices that can reasonably be charged for heating service.

CONTENTS

CHAPTER I—Origin and Development of District Heating
CHAPTER II—Selling of Heat
CHAPTER III—Heat Distribution Systems
CHAPTER IV—Metering
CHAPTER V—District Heating Stations
CHAPTER VI—Methods of Estimating Heating Requirements in Buildings
CHAPTER VII—Estimating Miscellaneous Steam Requirements in Buildings
CHAPTER VIII—Relation between Heat Load and Electric Load in Buildings
CHAPTER IX—The Use of Heating Data in Connection with Estimating on the Cost of Isolated Plant and Central Station Service
CHAPTER X—Relation between Central Station Heating and Central Station Lighting and Power

"District Heating" contains all the important data regarding the development of central station heating and is an invaluable handbook, not only for central station engineers, but also for those contemplating taking up this business which is rapidly becoming one of the largest and most important in the country.

Size, 6 x 9 in. 300 pages. 81 Figures.

CLOTH $3.00 NET

Published by the

Heating and Ventilating Magazine Co.

1123 Broadway, New York

National Association of Sheet Metal Contractors, at its annual meeting in Denver, Colo., June 7-11, elected the following officers: President, Paul F. Brandstedt, Washington, D. C.; first vice-president, Julius Gerock, St. Louis, Mo.; second vice-president, George Harms, Peoria, Ill.; third vice-president, T. P. Walsh, San Antonio, Tex.; fourth vice-president, Paul Biersach, Milwaukee, Wis.; secretary, Edwin L. Seabrook, Philadelphia; treasurer, William A. Fingles, Baltimore, Md. Trustees for three years: Alfred Holtman, Kansas City, Mo.; Frank Hiller, Cleveland, O.; and D. M. Haines, Chicago. It was voted to hold next year's convention in Peoria, Ill.

Central Supply Association held a well-attended meeting at the Auditorium Hotel, Chicago, June 16. In addition to the address of President C. V. Kellogg, the speakers were E. S. Taylor, of the Chicago Plan Commission, who spoke on city planning; and J. B. Chambers, who presented a paper on "Credit Exchange."

Canadian Domestic Engineering Co., Ltd., Montreal and Toronto, Canada, announces the following changes in its organization: President, Almond D. Woodman; vice-president, Ernest Belanger, C. E.; secretary-treasurer, M. A. Pariseau; chief engineer, Claude A. Bulkeley, M. Sc.; superintendent of works, W. A. Strangford; associate engineers, H. H. Angus, Toronto; F. W. Walker, Winnipeg; R. Percy Sime, Montreal and Winnipeg; George Huey, Boston, and J. E. Woodwell, New York. As announced in these columns, Mr. Bulkeley has recently joined the staff of this firm, having been previously enginer in charge for Marks & Woodwell consulting engineers, of New York, which designed the entire mechanical and electrical equipment, costing over $5,000,000, of the new Pennsylvania Terminal Post Office, in New York. Mr. Bulkeley had direct supervision of this work.

Eastern Supply Association met in Atlantic City, June 16, when 80 members were present. Following the address of President L. O. Koven, the credit bureau reported that it had handled 4,925 claims during the year, their total value being $525,260.52. Of this amount the collections amounted to $322,065.12. Addresses were made by John S. Nicholl, president of the Riverside Metal Works, Cambridge, Mass., on "A Few Essentials of Letters of Pulling Power," and

H&M Thermometers

Study Closely H&M Tycos Catalogues

It may point the way to material savings in *your* production. We are sincere in our belief that *our* catalogues differ from others, not claiming especial originality, but careful preparation and interest, avoiding bombastic claims; telling rather of H&M *Tycos* Products, of their applications, illustrated and described in a concise manner, derived from over a half century's experience in thermometer making. We endeavor to build our catalogues as *our instruments* in such a manner they become *assets to the owners.* Naturally therein contained will be words as to reliability, accuracy and the reasons behind *Tycos* quality, but *not* to the point of of boastful boredom.

We believe if interested in Temperature Regulators, Pressure Regulators, Recording Thermometers, Angle and Straight Stem Thermometers, Engraved Stem Thermometers, Hygrodeiks and Hygrometers. Thermo-Electric and Radiation Pyrometers, our catalogues are indispensable—May we place them in your hands? Kindly name type of instrument in which you are interested.

The H&M Division
Taylor Instrument Companies
Rochester, N.Y.

nue, Douglass and Clintonville School buildings in Columbus.

C. A. McNeill & Co., Los Angeles, Cal., heating and ventilating Fourteenth Street intermediate school, for $7,000.

Joseph A. Langdon & Sons Co., Pittsburgh, Pa., heating and ventilating new school at Tarentum, Pa., for $17,000.

Morehead Plumbing & Heating Co., Morehead, Minn., heating and plumbing Trinity Lutheran Church, at that place, for $3,675.

American Heating & Ventilating Co., Cincinnati, O., heating and ventilating new North Lewisburg School at North Lewisburg, O., for $3,446.

Columbus Heating & Ventilating Co., Columbus, O., heating and ventilating new $23,000 school building at Waynesville, O.

Eastman Vapor Vacuum System Co., Boston, Mass., heating and ventilating new Harvard moving picture theatre in North Cambridge, for $2,600; also heating apartment building on Hanover Street, for Forte & Staffano, for $8,500.

J. A. Quinn & Co., Seymour, Ind., heating and plumbing new City Hall at Burlington, Ind., for $4,503.

L. W. Rosen Co., Madison, Wis., heating and ventilating new Fair Oaks School, for $7,190.

Knee Heating & Ventilating Co., Grand Rapids, Mich., heating and ventilating new First Methodist Church, for 13,000.

American Warming & Ventilating Co., Toledo, O., heating and plumbing school building at Haskins, for $4,500; also heating and ventilating Lykins School for $3,000, and Vaughsville and Rymer schools for $4,500.

John L. Reid, Newark, N. J., steam heating $300,000 building in Newark, comprising a theatre, restaurant, cafes and offices.

John F. McCarthy, Lawrence, Mass., heating and plumbing new school building for $24,644 (for the heating) and $14,545 (for the plumbing).

Atlas Co., San Francisco, Cal., heating and ventilating Juvenile Detention Home on West Mission Street, San Francisco, for $3,990. The plumbing contract went to H. Lawson of San Francisco at his bid of $14,350.

Trade Literature.

REDUCING BOILER ROOM COSTS BY HEATING AND SOFTENING THE FEED WATER is explained at length in Cochrane Engineering Leaflet No. 17, published by the Harrison Safety Boiler Works, 3189 North 17th Street, Philadelphia, Pa. The apparatus featured in the leaflet for this purpose is the Sorge-Cochrane

There may be a hundred heat insulators that will cover your pipes, but only one that will insulate them

It is our business to investigate the problem of heat insulation in your plant and recommend the proper material. We can do this impartially, too, because of the variety of insulations we make and install.

There is another important feature covered by this service that should not be overlooked, and that is the proper application of the insulation.

One style of J-M Heat Insulation

Probably the best recommendation we can offer the engineer as to our efficiency in this line is to say that we maintain specialists all over the country, whose experience has been the broadest and our contract departments are made up of men who are experts in the application of various insulations.

Why not let us talk over your work with an idea of making the thermal efficiency of your plant a record breaker?

H. W. JOHNS-MANVILLE CO. **New York and every large city**

JOHNS-MANVILLE SERVICE COVERS THE CONTINENT

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

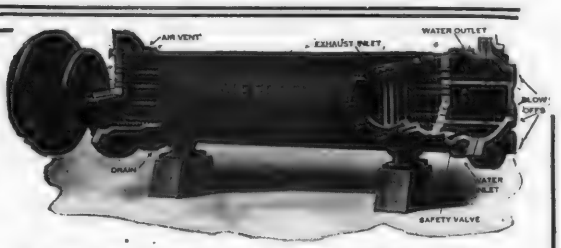
hot process water softener. The leaflet also contains considerable general information on the subject of water softening, based on the theory that only by chemical treatment can scale-forming water profitably be rendered suitable for feeding to boilers. Reasons are also given why chemical reactions are more rapid and complete in hot water than in cold water, while the precipitate is less soluble and is coarser and settles more rapidly. Size 6x9 in. (standard). Pp. 20.

STEAM SPECIALTIES, featuring the product of the Steam Appliance Co., Milwaukee, Wis., are brought to the attention of the trade in a well-prepared catalogue, devoted to the Triumph oil separators, Victor steam separators, including both horizontal and vertical types; Triumph exhaust head, Peters improved Corliss valve steam trap, Peters grease trap, Peters water line governor, Henry steam flue cleaner and White improved hollow blast grate bars. The catalogue also contains notable lists of users of each of these devices, together with a number of impressive testimonial letters. Illustrations and dimensions accompany the description of each device. Size 5½x8 in. Pp. 78.

BLAISDELL EQUIPMENT, made by the Blaisdell Machinery Co., Bradford, Pa., is the title of a notable loose-leaf catalogue devoted to the smaller air compressing and air exhausting machines made by this company. The company states that bulletins covering its complete line are available upon request. The catalogue opens with a description of the uses of compressed air, showing the wide field for such apparatus. There is also included an unusual amount of data on compressed air and on vacuum work. Under "Air Compressor Installation and Operation" are given full directions regarding this apparatus for the convenience of the designing and contracting engineer. A special section is devoted to "Vacuum Cleaning Systems" in which the company has long specialized. Types of its vacuum cleaning apparatus for a wide variety of uses are shown, followed by illustrations and lists of buildings equipped with Blaisdell apparatus. Size 6x9 in. (standard). Pp. 118.

A PRACTICAL AND EFFICIENT TYPE OF CONDUIT and insulation for either steam or hot water is featured in a blotter souvenir sent out by J. C. Hornung, 111 West Monroe Street, Chicago, showing a sectional view of the conduit referred to and containing a notice to central station managers that Mr. Hornung is prepared to make valuation, operation and efficiency reports of central station light, heat and power plants, and that he is also prepared to furnish plans, specifications and superintendence covering central station construction work. It is noted that Mr. Hornung was for fourteen years with the W. H. Schott Co., of Chicago.

Correct Engineering Principles
are followed in the construction of the
ALBERGER MULTI-HEAD WATER HEATERS
Horizontal or Vertical

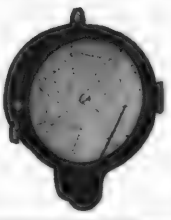


Proper provision is made for expansion and contraction of the tubes. Built of the highest grade materials, consisting of pure copper and cast-iron.

For boiler feed water, gravity and forced circulation heating systems, hot water service for domestic purposes, etc. Catalogue on request.

ALBERGER HEATER COMPANY, BUFFALO, N. Y.
CHICAGO, ILL.

Your Choice of Seven Types
is offered in our line of
Standard Recording Thermometers
We make a specialty of hot water and steam indicators
Send for Catalogue VH
Standard Thermometer Co., Clifton and Shirley Sts., Boston, Mass.



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(*Opportunity Talks No. 4*)

Wood Casing "Standard Insulation"

THE PART UNDERGROUND PIPE INSULATION HAS PLAYED IN THE SUCCESS OF CENTRAL HEATING

No one feature of a profitable district heating plant is more important than the insulation of the underground piping. Successes have been directly traceable to this cause more than to any other. For the purpose of determining by actual experiments the durability and efficiency of the different methods of insulating underground steam mains, the American District Steam Company at various times has installed mains, employing every known material and method which appeared to have merit. Records were kept of transmission losses, exterior temperatures, ground temperatures, maintenance, etc. As a result the

American District Steam Company's "Standard" Construction

was found to be

BEST BY TEST

This material has solved the problem of heat losses from underground mains and has **stopped the leaks** that were formerly so expensive.

Why Not Investigate the Proposition of Central Heating Service in Your City?

Get in touch with us and let us tell you our plan.

Ask for Bulletin No. H-129.

Reconstruction—Substituting Wood Casing for Tile

American District Steam Company

General Offices and Works: NORTH TONAWANDA, N. Y.

CHICAGO, ILL.—First National Bank Bldg. **NEW YORK—West Street Building**
SEATTLE, WASH.—Hoge Building

CLARAGE EXHAUST FANS, Type CI, covering the company's line of cast-iron volume exhausters and blowers, are the subject of a new catalogue published by the Clarage Fan Co., Kalamazoo, Mich. These fans are built in four sizes, Nos. 5, 6, 7 and 8, the numbers in each case being the same as the diameter in inches in the suction or outlet connection. The housing or fan case is cast in one piece and is supported by cast-iron side plates. These plates are larger than the fan wheel and by taking out eight cap screws and removing the plate, the wheel may be withdrawn from the housing. The same feature makes the fans adjustable and reversible, as any one of seven different directions of discharge may be secured and the arm supporting the bearing may be placed on either side of the fan. Although furnished regularly as single inlet exhaust fans, with a collar for the suction pipe or intake side, it is possible by removing the collar and plate to use these fans as blowers having two inlets and thus obtain the resulting high efficiency. The special dust-proof, oil-tight, enclosed bearings are mentioned as features of importance in dusty installations, while the large supply of oil assures a cool running machine. To invert the fan, it is only necessary to interchange the positions of the oil supply pipe and the plug in the bearing. The type CI fans, as single inlet exhausters, may be used to remove smoke, chemical vapors, or fumes from forge fires, stoves, ranges, vats or kettles; exhausting air in small ventilating installations for toilet rooms, telephone booths, etc.; or they may be used to convey light material, such as removing dust from emery wheels or tumbling barrels or shavings from wood-working machines. As double inlet blowers the type CI fans furnish the blast for forge fires, coke ovens, small drying systems, or serve as forced draft fans for small boiler plants. Size 6x9 in. (standard). Pp. 8.

¾ H.P. Equipment

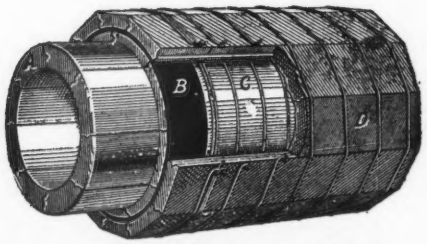
Spencer Turbine Vacuum Cleaners

are manufactured in sizes from ¾ H. P. to 40 H. P.

Send for catalogue

SPENCER TURBINE CLEANER COMPANY

HARTFORD, CT.



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steampipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

Let us answer your questions and tell you all about it. Booklet on request.

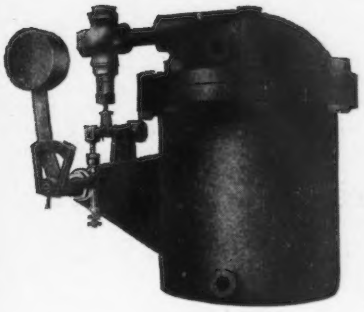
A. WYCKOFF & SON COMPANY

ELMIRA . . N. Y.

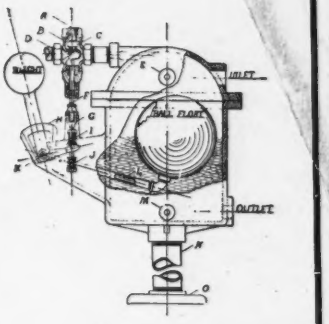
Chicago, Ill., 551 West 14th Place

The Lytton Thermo Syphon Trap

Approved and Specified by Heating Experts



Especially designed to perform important duties in connection with the handling of condensation under the complicated operating conditions of Pressure, Vapor, and Vacuum Steam Heating Systems.



It automatically discharges all condensation direct into the boiler.
Positive in operation, irrespective of the pressure or vacuum.
Releases all air and non-condensable gases without loss of vapor.
Air relief tanks and receivers are not required with this trap.
Prevents radiators from becoming flooded or air bound.
Renders possible more heat on less boiler pressure.
Eliminates "hammering" and other nerve-wrecking noises.
Prevents burning of boilers, due to water becoming locked in system.
Assures perfect circulation and even distribution of steam.
Reduces coal consumption and labor to the minimum.
With sufficient pressure will take returns from below boiler water line.
Is installed only 3″ above water line and requires very little room.
Noiseless in operation and is easy to install.
Is heavily constructed, has no delicate parts, and is fool-proof.
Is guaranteed by us in every respect, and price is attractively low.

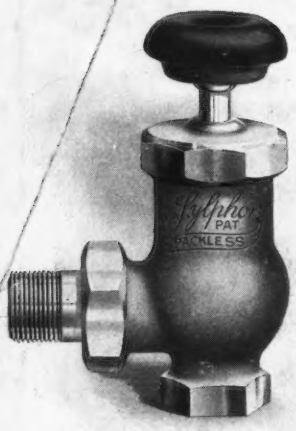
BULLETIN NO. 14, which will be sent upon request, fully describes the special mechanical features and refinements of this interesting device, and same should be in the possession of every Engineer, Architect, Heating Contractor, and owner of a steam heating system. We furnish full instructions and blue print for guidance in making installation and cooperate with the purchaser in every manner possible. We solicit correspondence concerning the handling of condensation from heating systems or any other class of steam using apparatus.

LYTTON MFG. CORPORATION

FRANKLIN, VIRGINIA

Manufacturers of Direct Return Traps, Steam Traps, Vacuum Traps, Lifting Traps, Thermo Syphon Traps, Reducing Valves, Blow-Off Valves.

Profitable Radiator Valves



An absolutely leakless radiator valve

The heating trade, like other good merchants, look sharply to their profits. Good merchants will not encourage the sale of cheap, unprofitable stuffing box radiator valves.

Stock and display the profitable IDEAL Sylphon Packless Radiator Valves. It may add nothing to your immediate profits that stuffing box valves are everlastingly getting loose at the stems and leaking rusty water upon good rugs and floors.

But it is a great deal to your immediate and future profit if building owners know that they can buy SYLPHON Packless Valves that positively won't leak as long as their building stands. Therefore tell your customers about them.

They are profitable goods for your customers and reputation builders for you. Sell them for every job.

AMERICAN RADIATOR COMPANY

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